

Oil Pollution Abstracts. Volume 7, Number 1
(January 1980-June 1980)

California Univ.
Santa Barbara

Prepared for

Municipal Environmental Research Lab.
Cincinnati, OH

Jan 81

U.S. Department of Commerce
National Technical Information Service

NTIS

EPA-600/2-81-005
January 1981

OIL POLLUTION ABSTRACTS

Volume 7, Number 1
(January 1980 - June 1980)

by

Helmut Ehrenspeck, Christine Matuck, Dorothy Hannan,
Rosemary Stefani, and Timothy Marozick
Marine Science Institute
University of California
Santa Barbara, California 93106

Grant No. R-807366-01-0

Project Officer

L. T. McCarthy, Jr.
Oil & Hazardous Materials Spills Branch
Solid & Hazardous Waste Research Division
Municipal Environmental Research Laboratory-Cincinnati
Edison, New Jersey 08817

Principal Investigator
Henry W. Offen
Marine Science Institute
University of California
Santa Barbara, California 93106

MUNICIPAL ENVIRONMENTAL RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
CINCINNATI, OHIO 45268

TECHNICAL REPORT DATA (Please read Instructions on the reverse before completing)		
1. REPORT NO. EPA-600/2-81-C05	2.	3. RECIPIENT'S ACCESSION NO. PB81 140493
4. TITLE AND SUBTITLE OIL POLLUTION ABSTRACTS Vol. 7, No. 1 (January 1980 - June 1980)	5. REPORT DATE January 1981 Issuing Date.	
	6. PERFORMING ORGANIZATION CODE	
7. AUTHOR(S) Helmut Ehrenspeck, Christine Matuck, Dorothy Hannan, Rosemary Stefani and Timothy Marozick	8. PERFORMING ORGANIZATION REPORT NO.	
9. PERFORMING ORGANIZATION NAME AND ADDRESS MARINE SCIENCE INSTITUTE University of California Santa Barbara, California 93106	10. PROGRAM ELEMENT NO.	
	11. CONTRACT/GRANT NO. R-807366-01-0	
12. SPONSORING AGENCY NAME AND ADDRESS Municipal Environmental Research Laboratory --Cin., OH Office of Research and Development U.S. Environmental Protection Agency Cincinnati, OH 45268	13. TYPE OF REPORT AND PERIOD COVERED Quarterly, Jan '80 - June '80	
	14. SPONSORING AGENCY CODE EPA/600/14	
15. SUPPLEMENTARY NOTES Leo T. McCarthy, Jr., Project Officer (201) 321-6630		
16. ABSTRACT OIL POLLUTION ABSTRACTS is a semi-annual basic reference guide to current scientific and technical literature relevant to terrestrial and aquatic oil pollution. This issue contains 750 bibliographic entries with abstracts, covering the years 1977 to 1980. The entries are arranged in eight major topical categories comprising thirty-seven specific subcategories. The major categories are as follows: Oil pollution detection, analysis and evaluation; oil pollution prevention response and control; environmental impacts of oil pollution; fate of oil in the environment; pollution aspects of oil exploration, development and production; pollution aspects of oil transport, transfer and storage; petroleum and petrochemical industry waste treatment and disposal; and miscellaneous publications. A permuted Subject Keyword Index provides access to every entry, and author and patent index are included. This report is submitted in partial fulfillment of EPA Grant No. R-807366-01 by the Marine Science Institute, University of California, Santa Barbara, under the sponsorship of the U.S. Environmental Protection Agency.		
17. KEY WORDS AND DOCUMENT ANALYSIS		
a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Abstracts Bibliographies Research Patent Subject indexes	Oil pollution Oil pollution events Oil spill research Oil pollution control Oil pollution patents	
18. DISTRIBUTION STATEMENT RELEASE TO PUBLIC	19. SECURITY CLASS (This Report) UNCLASSIFIED	21. NO. OF PAGES 355
	20. SECURITY CLASS (This page) UNCLASSIFIED	22. PRICE

DISCLAIMER

This report has been reviewed by the Municipal Environmental Research Laboratory-Cincinnati, U.S. Environmental Protection Agency, and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the U.S. Environmental Protection Agency, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

FOREWORD

The Environmental Protection Agency was created because of increasing public and government concern about the dangers of pollution to the health and welfare of the American people. Noxious air, foul water, and spoiled land are tragic testimony to the deterioration of our natural environment. The complexity of that environment and the interplay between its components require a concentrated and integrated attack on the problem.

Research and development is that necessary first step in problem solution, and it involves defining the problem, measuring its impact, and searching for solutions. The Municipal Environmental Research Laboratory develops new and improved technology and systems for preventing, treating, and managing waste-water and solid and hazardous waste pollutant discharges from municipal and community sources, for preserving and treating public drinking water supplies, and for minimizing the adverse economic, social, health, and aesthetic effects of pollution. This publication is one of the products of that research, a most vital communication link between the researcher and the user community.

This report is a product of the above efforts. It cites current literature, research, patents, and other materials relevant to the oil pollution abatement program and is published in an abstract format on a semi-annual basis. As such, it serves as a basic reference document for all those interested in oil spill and oil pollution control. This project is part of the continuing program of the Oil and Hazardous Materials Spills Branch, MERL-Ci, to assess and mitigate the environmental impact of oil pollution.

Francis T. Mayo
Director
Municipal Environmental Research Laboratory

ABSTRACT

OIL POLLUTION ABSTRACTS is a semiannual basic reference guide to current scientific and technical literature relevant to terrestrial and aquatic oil pollution. This issue contains 750 bibliographic entries with abstracts, covering the years 1977 to 1980. The entries are arranged in eight major topical categories comprising thirty-seven specific subcategories. The major categories are as follows: Oil pollution detection, analysis and evaluation; oil pollution prevention, response and control; environmental impacts of oil pollution; fate of oil in the environment; pollution aspects of oil exploration, development and production; pollution aspects of oil transport, transfer and storage; petroleum and petrochemical industry waste treatment and disposal; and miscellaneous publications. A permuted Subject Keyword Index provides access to every citation, and author and patent indexes are included. This report is submitted in partial fulfillment of EPA Grant No. R-807366-01 by the Marine Science Institute, University of California, Santa Barbara, under the sponsorship of the U.S. Environmental Protection Agency.

OIL POLLUTION ABSTRACTS - TOPICAL OUTLINE

- A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
 - 1. Detection and Monitoring
 - 2. Remote Sensing
 - 3. Sampling and Analysis
 - 4. Source Identification
- B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
 - 1. Containment
 - 2. Cleanup and Removal
 - 3. Environmental Restoration
 - 4. Personnel Training
 - 5. Contingency Planning and Spill Response
 - 6. Legal and Regulatory Aspects
 - 7. General Prevention and Control Measures
- C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
 - 1. Biological Aspects
 - 2. Physical and Chemical Aspects
 - 3. Social and Economic Aspects
 - 4. Environmental Response and Recovery
 - 5. Baseline and Environmental Impact Studies
 - 6. Legal and Regulatory Aspects
 - 7. General Aspects
- D. FATE OF OIL IN THE ENVIRONMENT
 - 1. Biodegradation
 - 2. Physical and Chemical Processes
 - 3. Models, Simulations and Predictions
 - 4. General Fate of Oil
- E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT AND PRODUCTION
 - 1. Biological Aspects
 - 2. Physical and Chemical Aspects
 - 3. Social and Economic Aspects
 - 4. Legal and Regulatory Aspects
 - 5. General Aspects
- F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE
 - 1. Tankers and Ships
 - 2. Pipelines
 - 3. Loading and Offloading Facilities
 - 4. Storage Facilities
 - 5. Legal and Regulatory Aspects
 - 6. General Aspects
- G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL
 - 1. Waste Treatment and Disposal Methods
 - 2. Oil-Water Separation
 - 3. Waste Oil Reclamation and Reuse
 - 4. Legal and Regulatory Aspects
- H. MISCELLANEOUS PUBLICATIONS

CONTENTS

	Page
Abstract	iv
Topical Outline	v
Acknowledgements	
Introduction	
Serials Listing	
Abbreviations - Acronyms	
Reports, Publications and Patents	
A. OIL POLLUTION DETECTION AND EVALUATION	
1. Detection and Monitoring	1
2. Remote Sensing	11
3. Sampling and Analysis	17
4. Source Identification	39
B. OIL POLLUTION PREVENTION AND CONTROL	
1. Containment	45
2. Cleanup and Removal	47
3. Environmental Restoration	63
4. Personnel Training	63
5. Contingency Planning and Spill Response	64
6. Legal and Regulatory Aspects	76
7. General Prevention and Control Measures	77
C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION	
1. Biological Aspects	86
2. Physical and Chemical Aspects	134
3. Social and Economic Aspects	140
4. Environmental Response and Recovery	141
5. Baseline and Environmental Impact Studies	142
6. Legal and Regulatory Aspects	150
7. General Aspects	152

	Page
D. FATE OF OIL IN THE ENVIRONMENT	
1. Biodegradation	171
2. Physical and Chemical Processes	180
3. Models, Simulations and Predictions	183
4. General Fate of Oil	189
E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT AND PRODUCTION	
1. Biological Aspects	196
2. Physical and Chemical Aspects	202
3. Social and Economic Aspects	204
4. Legal and Regulatory Aspects	205
5. General Aspects	208
F. POLLUTIONS ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE	
1. Tankers and Ships	219
2. Pipelines	223
3. Loading and Offloading Facilities	225
4. Storage Facilities	227
5. Legal and Regulatory Aspects	228
6. General Aspects	228
G. PETROLEUM AND PETROCHEMICAL INDUSTRY WASTE TREATMENT AND DISPOSAL	
1. Waste Treatment and Disposal Methods	231
2. Oil-Water Separation	241
3. Waste Oil Reclamation and Reuse	242
4. Legal and Regulatory Aspects	243
H. MISCELLANEOUS	245
Guide to the Master List of Keywords and the Subject Keyword Index	250
Master List of Keywords	251
Subject Keyword Index	260
Author Index	327
Patent Index	338
Appendix A: Periodicals Reviewed	339
Appendix B: OIL POLLUTION ABSTRACTS Availability and Ordering Information	342
Technical Report Data Page	343

ACKNOWLEDGEMENTS

The authors wish to thank the staff of the Marine Science Institute, the Sciences-Engineering Library and the Interlibrary Loans Office at the University of California, Santa Barbara, for their assistance during the research stages of this project. We appreciate the assistance of Ms. Betty Miles and Ms. Jill Marson in typing the camera ready copy of this issue of Oil Pollution Abstracts.

INTRODUCTION

OIL POLLUTION ABSTRACTS is a semiannual reference document which summarizes current scientific and technical publications relevant to all aspects of terrestrial and aquatic oil pollution, with emphasis on the marine environment. This issue contains references to 750 relevant articles, reports, books, conference papers, patents, and other literature published after 1976.

The 750 literature entries are separated into eight major topical categories which are further divided into thirty-seven specific sub-categories (see Topical Outline, p. v). Within each specific category, entries are arranged alphabetically by first author. Each cited literature entry contains the following information:

- 1) a citation number 80A-xxxx (sequential for the entire year);
- 2) a standard bibliographic citation (title, author(s), and source);
- 3) a set of descriptive keywords;
- 4) a brief summary, if available; and
- 5) the secondary source of the entry, wherever applicable.

Each entry is provided with several descriptive terms selected from a controlled master list of approximately 400 keywords (see Master List of Keywords) and, wherever necessary, additional free-language terms prefaced by an asterisk (*). The string of keywords for each entry is alphabetically permuted by computer to form the Subject Keyword Index, permitting rapid and specific subject access to any entry.

Each OIL POLLUTION ABSTRACTS issue includes a comprehensive Author Index, and a Patent Index which enumerates patents by country of issuance. A list of the scientific and technical source periodicals which are regularly scanned for oil pollution related literature forms Appendix A, and an OIL POLLUTION ABSTRACTS availability listing and ordering sheet is attached as Appendix B.

OIL POLLUTION ABSTRACTS*

Issues currently available, in press, or in preparation

*This series was formerly entitled:
OIL POLLUTION REPORTS (1978: Vol. 5, No. 2 to Vol. 5, No. 4)
OIL SPILL AND OIL POLLUTION REPORTS (1974 to 1978: Vol. 5, No. 1)

	<u>DATES COVERED</u>	<u>REPORT NUMBER</u>
1974	July 74 - Oct. 74	EPA-670/2-75-003
1975	Nov. 74 - Feb. 75	EPA-670/2-75-044
1975	Feb. 75 - Apr. 75	EPA-670/2-75-059
1975	May 75 - July 75	EPA-600/2-76-129
1975	Aug. 75 - Oct. 75	EPA-600/2-76-113
1976	Nov. 75 - Jan. 76	EPA-600/2-76-185
1976	Feb. 76 - Apr. 76	EPA-600/2-76-215
1976	May 76 - July 76	EPA-600/2-76-266
1976	Aug. 76 - Oct. 76	EPA-600/2-77-037
1977	Nov. 76 - Jan. 77	EPA-600/2-77-075
1977	Feb. 77 - Apr. 77	EPA-600/2-77-111
1977	May 77 - July 77	EPA-600/2-77-243
1977	Aug. 77 - Oct. 77	EPA-660/2-78-005
Vol. 5, No. 1	Nov. 77 - Jan. 78	EPA-600/2-78-071
Vol. 5, No. 2	Feb. 78 - May 78	EPA-600/7-78-160
Vol. 5, No. 3	June 78 - Sep. 78	EPA-600/7-78-218
Vol. 5, No. 4	Oct. 78 - Dec. 78	EPA-600/7-79-040
Vol. 6, No. 1	Jan. 79 - Mar. 79	EPA-600/7-79-160
Vol. 6, No. 2	Apr. 79 - June 79	EPA-600/7-79-254
Vol. 6, No. 3	July 79 - Sep. 79	EPA-600/7-80-007
Vol. 6, No. 4	Oct. 79 - Dec. 79	EPA-600/7-80-053
Vol. 7, No. 1	Jan. 80 - June 80	Submitted 7/80
Vol. 7, No. 2	July 80 - Nov. 80	To be submitted 11/80

For complete ordering information, please see Appendix B.

ABBREVIATIONS/ACRONYMS

atm	atmosphere	ml	milliliter
bbl	barrel	mm	millimeter
C	carbon	MS	mass spectrometry
°C	degrees Centigrade	N	nitrogen
cm	centimeter	N.A.	not available
COW	crude oil washing	nm	nautical mile
DWP	deepwater port	O	oxygen
dwt	dead weight ton	OCS	outer continental shelf
EIS	environmental impact statement	OPA	OIL POLLUTION ABSTRACTS
°F	degrees Fahrenheit	oz	ounce
ft	foot	PAH	polycyclic aromatic hydrocarbon
g	gram	pH	the negative log of the H ion concentration
gal	gallon	ppb	parts per billion
GC	gas chromatography	ppm	parts per million
GLC	gas-liquid chromatography	SBT	segregated ballast tank
gpd	gallons per day	sp.	species
gph	gallons per hour	TLC	thin-layer chromatography
gpm	gallons per minute	UK	United Kingdom
ha	hectare	US	United States
hr	hour	USSR	Union of Soviet Socialist Republics
in	inch	UV	ultraviolet
IR	infrared	VLCC	very large crude carrier
kg	kilogram	vs	versus
km	kilometer	WSF	water soluble fraction
kn	knot	wt	weight
L	liter	yr	year
lb	pound	μ	micron
LC	liquid chromatography	g	microgram
LD	lethal dose	%	percent
LNG	liquefied natural gas	/	per
LOT	load on top	~	approximately
LPG	liquefied petroleum gas	>	greater than
m	meter	<	less than
mg	milligram		
mi	mile		
min	minute		

ABBREVIATIONS/ACRONYMS (continued)

API	American Petroleum Institute
ASTM	American Society for Testing and Materials
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
DOE	Department of Energy
EPA	Environmental Protection Agency
ERDA	Energy Research and Development Administration
FAO	Food and Agricultural Organization
FEA	Federal Energy Administration
IMCO	International Maritime Consultative Organization
NASA	National Aeronautics and Space Administration
NBS	National Bureau of Standards
NOAA	National Oceanic and Atmospheric Administration
NTIS	National Technical Information Service
OHMSETT	Oil and Hazardous Materials Simulated Environmental Test Tank
SSIE	Smithsonian Science Information Exchange
UN	United Nations
UNEP	United Nations Environment Program
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	United States
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USFWS	US Fish and Wildlife Service
USGS	United States Geological Survey
USN	United States Navy

REPORTS, PUBLICATIONS AND PATENTS

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

1. Detection and Monitoring

80A-0001

GUIDE TO METEOROLOGICAL SERVICES

Anon. 1977.

New York, World Meteorological Organization, 1977. Publication No. 471, 129 p.

Monitoring, Information systems, Manuals, *Meteorological services

Information on the practices and procedures of varied meteorological services is presented in this guide. Specific details of pollution monitoring services are described. [possibly oil pollution related]

[from Oceanic Abstracts 15(4):#78-05899. 1978]

80A-0002

TAPS SPILL DETECTION NEEDS IMPROVING [news brief]

Anon. 1979.

Marine Pollution Bulletin 10(10):280.

Trans-Alaska pipeline, Spill response, Equipment, Performance testing

A pipeline spill detection system which was designed to detect spills greater than 750 barrels of oil a day, proved ineffective in determining any spills less than 3000 barrels a day. Two oil spillages from the Trans-Alaska pipeline led to the conclusion of the system's ineffectiveness.

80A-0003

DEVELOPMENT OF A CHEMICAL METHOD FOR DETECTING PETROGENIC HYDROCARBONS IN THE PRESENCE OF BIOGENIC HYDROCARBONS

Brown, L.R., J.R. Heitz, D.H. Miles, and C.D. Minshew. 1977.

Mississippi State University, Final Report USCG-D-40-79, AD-A072-475/7SL. 37 p.

Hydrocarbons, Biogenic hydrocarbons, Concentrations, Chemical analysis, Chromatography

The method developed involves use of high pressure liquid chromatography and measuring fluorescence in the range of 418 nm after excitation at 403 nm. The method is sensitive to levels of less than 0.1 μ g, readily quantifiable at 1 μ g, and capable of detecting petroleum hydrocarbons in the presence of overwhelming amounts of biogenic hydrocarbons.

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

1. Detection and Monitoring

80A-0004

EVALUATION OF THE USEFULNESS OF BIOLOGICAL INDICATORS FOR DETECTING PETROLEUM HYDROCARBONS IN THE WATER COLUMN

Brown, L.R., C.D. Minshew, and M.R. Smith. 1979.

Mississippi State University, Final Report USCG-D-39-79, AD-A072-474/OSL. 33 p.

Monitoring, Bioindicators, Contamination, Metabolism, Bioassay

Oysters, mussels, crabs, and marshgrass were tested in flow-through tanks and in the field as possible bioindicators of oil pollution. The results of these studies do not support the use of biological monitors as the primary means of detecting petroleum hydrocarbon levels in the water column in the vicinity of a proposed deepwater port site or following an oil spill cleanup.

80A-0005

DETECTING LEAKS IN PIPELINES AND STORAGE TANKS

Butts, E.O. 1977.

Engineering Journal 60(3):45-47.

Leakage, Oil discharges, Pipelines, Oil tanks, Oil transfer, Monitoring, Equipment

Oil leaks from pipelines and storage tanks are a substantial source of inland pollution. This article outlines the magnitude of the problem, the types of available leak detection products and methods, and stresses the need for legal incentives to end this type of pollution.

80A-0006

OIL POLLUTION ALONG COASTAL AREAS OF HONG KONG

Cheung, M.T., T.Y. Cheng, S.W. Leung, C.C. Lo, and L.M. Mak. 1979.

Marine Pollution Bulletin 10(8):228-231.

Shorelines, Contamination, Monitoring, Hydrocarbons, *Hong Kong

"The level of total hydrocarbon in three chosen sites in Hong Kong was determined over a period of 8 months, September 1977 to April 1978 The oil pollution in Hong Kong shoreline waters is 230-750 times higher than deep ocean water, but the level is not yet hazardous."

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
1. Detection and Monitoring

80A-0007

BIOLOGICAL MONITORING AROUND AN OIL REFINERY

Dalby, D.H., E.B. Cowell, and W.J. Syrett. 1979.

Monitoring the Marine Environment: Proceedings of a Symposium, London, 28-29 September 1978. D. Nichols (ed.) London, Institute of Biology, 1979, Symposium No. 24. p. 141-152.

Monitoring, Bioindicators, Refineries, Waste oil, Wastewaters

Summary not available.

[from Marine Pollution Research Titles 6(10):#1814. 1979]

80A-0008

MONITORING THE MARINE ENVIRONMENT OF THE UNITED KINGDOM. THE FIRST REPORT OF THE MARINE POLLUTION MONITORING MANAGEMENT GROUP, 1975-1976
Department of the Environment, UK, Central Unit on Environmental Pollution. 1977.

London, Department of the Environment, 1977. Pollution Report No. 2, 82 p.

Monitoring, Marine environment, UK

Summary not available. [possibly oil pollution related]

[from Marine Pollution Research Titles 5(6):#964. 1978]

80A-0009

POLYCYCLIC AROMATIC HYDROCARBONS IN MARINE SEDIMENTS AND SHELLFISH NEAR CREOSOTED WHARF STRUCTURES IN EASTERN CANADA

Eaton, P. and V. Zitko. 1978.

International Committee for Exploration of the Sea, ICES, C.M.Pap. Rep., Report No. C.M. 1978/E:25. 7 p.

Detection, Source identification, PAH, Sediments, Coasts, Canada,
*Shellfish, *Creosote, *Wharf structures

Summary not available. [possibly oil pollution related]

[from Marine Pollution Research Titles 6(7):#1212. 1979]

80A-0010

DETECTION OF OIL SPILLS AT SEA [in French]

Fontanel, A. and A. Roussel. 1978.

Océanis, Vol. 4:673-691.

Oil spills, Marine environment, Source identification

Summary not available.

[from Marine Pollution Research Titles 6(10):#1817. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
1. Detection and Monitoring

80A-0011

ICE MOVEMENT BUOYS FOR TRACKING OIL SPILLS

Goodman, R.H. 1978.

AMOP Technical Seminar, 15-17 March 1978, Ottawa, Canada, Department of Fisheries and Environment, Environmental Protection Service, 1978, Proceedings. p. 246-259.

Monitoring equipment, Movement, Drift, Ice, *Tracking buoys

Summary not available.

[from RESORS, Canada Centre for Remote Sensing Database:#1018853. 1980]

80A0012

REVIEW OF ICE MOVEMENT BUOYS FOR TRACKING OIL SPILLS

Goodman, R.H. 1978.

Edmonton, Alberta Department of Environment, Environmental Protection Service, 1978. 45 p.

Monitoring equipment, Movement, Drift, Ice, *Tracking buoys

Summary not available.

[from RESORS, Canada Centre for Remote Sensing Database:#1018854. 1980]

80A-0013

A SEAFLOOR SEISMIC MONITORING NETWORK AROUND AN OFFSHORE OILFIELD PLATFORM AND RECORDING OF THE AUGUST 13, 1978 SANTA BARBARA EARTHQUAKE

Heney, T.L., T.-L. Yeng, J.K. McRaney, and D.V. Manov. 1979.

Offshore Technology Conference, 11th, Houston, Texas, 30 April-3 May 1979, Vol. 4:2219-2223. No. OTC 3613. Preprint.

Monitoring, Offshore, Platforms, Oil fields, Santa Barbara Channel, Risk analysis, *Seismicity

Described is an eight-element seismic monitoring array which has been established around the Dos Cuadros offshore oilfield in the Santa Barbara Channel. The desirability of monitoring seismicity around producing fields in faulted and earthquake prone areas is well established, because the risks and consequences of oil spills "are potentially more far reaching and the mitigating steps more involved than on land".

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
1. Detection and Monitoring

80A-0014

RESULTS FROM 3 YEARS MONITORING OF PARTICULATE OIL POLLUTION IN THE SEA
OFF THE COAST OF NORWAY

Heyerdahl, T., Jr. 1978.

Fisken og Havet, No. 2:3-12.

Monitoring, Coastal waters, Norway

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder
and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979.
Supplement 3:23, #3677. 1979]

80A-0015

JOINT IOC/WMO SUBGROUP OF EXPERTS ON THE IGOSS MARINE POLLUTION MONITORING
PILOT PROJECT ORGANIZED WITH THE SUPPORT OF UNEP

Intergovernmental Oceanographic Commission. 1978.

Summary Report [of] Second Session, Washington, D.C., 13-17 February 1978,
Report IOC-WMO/MAPMOPP-II/3. 37 p.

Monitoring, *UNEP, Marine environment, *IGOSS pilot project

Summary not available. [possibly oil pollution related]

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder
and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979.
Supplement 3:11, #3553. 1979]

80A0016

REPORT OF THE SECOND IOC/WMO WORKSHOP ON MARINE POLLUTION MONITORING
ORGANIZED WITH THE SUPPORT OF UNEP, Monaco, 14-18 June 1976

Intergovernmental Oceanographic Commission. 1977.

Reports of the Intergovernmental Oceanographic Commission, No. 10. 36 p.

Monitoring, UN, Marine environment, *IOC/WMO Workshop

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder
and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979.
Supplement 3:11, #3552. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
1. Detection and Monitoring

80A-0017

USE OF BIOLOGICAL INDICATORS FOR MONITORING EFFECT OF POLLUTANTS ON THE MARINE ENVIRONMENT

Iverson, R.L. 1978.

First American-Soviet Symposium on the Biological Effects of Pollution on Marine Organisms. T.W. Duke and A.I. Simonov (eds.), Gulf Breeze, Florida, US Environmental Protection Agency, Office of Research and Development, 1978. Report EPA-600/9-78-007, NTIS Report PB-285923. p. 95-106.

Monitoring, Marine organisms, Bioindicators, Predictions, Contamination, Marine environment

This paper discusses the use of certain marine organisms, which exhibit sensitive physiological responses to pollutants, as a means of predicting and monitoring pollution in the marine environments. The paper assesses bioassay methodology, the use of indicator species, and the use of biostatistical measures as indicators of pollutant effects. Petroleum hydrocarbons are among the several pollutants discussed or used as examples.

80A-0018

HYDROCARBONS IN MARINE ORGANISMS AND SEDIMENTS OFF WEST GREENLAND

Johansen, P., V.B. Jensen, and A. Büchert. 1977.

International Council for the Exploration of the Sea, C.M. Pap. Rep., No. C.M. 1977/E:21. 21 p.

Sampling Hydrocarbons, Marine organisms, Sediments, Greenland

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:24, #3681. 1979]

80A-0019

THE DETERMINATION OF PAHs IN ENVIRONMENTAL SAMPLES USING LIQUID CHROMATOGRAPHY

Katz, E. and K. Ogan. 1980.

Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 31st, Pittsburgh, Pennsylvania, 10-14 March 1980, Paper 22b.

Chemical analysis, Chromatography, PAH, Detection

Summary not available. [possibly oil pollution related]

[from Applied Spectroscopy 34(1):116. 1980]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
1. Detection and Monitoring

80A-0020

CONCENTRATION OF PETROLEUM RESIDUES IN THE WATERS AND SEDIMENTS OF
BAFFIN BAY AND THE EASTERN CANADIAN ARCTIC-1977

Levy, E.M. 1979.

Bedford Institute of Oceanography, Report BI-R-79-3. — p.

Detection, Concentrations, Hydrocarbons, Seawater, Sediments, Arctic,
Canada, *Baffin Bay

Summary not available. [Report is available from Bedford Institute of
Oceanography, Dartmouth, Nova Scotia, Canada B2Y 4A2.]

[from Journal of the Fisheries Research Board of Canada 36(12):1516. 1979]

80A-0021

FLUORESCENCE SPECTROPHOTOMETRY: PRINCIPLES AND PRACTICE AS RELATED TO
THE DETERMINATION OF DISSOLVED/DISPERSED PETROLEUM RESIDUES IN SEAWATER.

Levy, E.M. 1977.

Bedford Institute of Oceanography, Report BI-R-77-7. 21 p.

Analytical techniques, Seawater, Hydrocarbons, *Fluorescence spectro-
photometry

Summary not available. [Report is available from Bedford Institute of
Oceanography, Dartmouth, Nova Scotia, Canada B2Y 4A2.]

[from Underwater Information Bulletin 10(6):#7812/1319. 1978]

80A-0022

APPARATUS FOR DETECTING PRESENCE OF OIL IN A BODY OF WATER

Maham, R.M. and M.D. Beasley. 1978.

US Patent 4,131,773

Detection, Oil slicks, Equipment, Design engineering, Patent

An apparatus for detecting oil in a body of water employs a floating
structure which includes at least one pair of electrodes that are immersed
in the water. At least one electrode is surrounded by an absorbent
oleophilic material so that an electric measurement will provide an
indication of the presence of oil in the body of water.

[from Petroleum Abstracts 19(38):#267,752. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

1. Detection and Monitoring

80A-0023

SPECTROPHOTOMETRIC ESTIMATION OF THE LEVELS OF HYDROCARBONS IN SEAWATER IN THE WESTERN ENGLISH CHANNEL FOLLOWING THE AMOCO CADIZ SPILL OF 30 MARCH TO 18 APRIL 1978 [in French]

Marchand, M. 1978.

Actes des Colloques du Centre National pour l'Exploitation des Oceans, No. 6:27-38.

Concentrations, Detection, Spectrometry, WSF, Seawater, Amoco Cadiz spill, English Channel

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:30, #3743. 1979]

80A-0024

A METHOD FOR THE DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN ANIMAL TISSUE

Mitchell, C.E. 1979.

Bulletin of Environmental Contamination and Toxicology 23(4/5):669-676.

Chemical analysis, PAH, Animals, Detection

This paper describes a method for the isolation and analysis of polycyclic aromatic hydrocarbons in biological samples that is rapid, precise, and avoids a number of the manipulative steps of other methods.

80A-0025

MONITORING THE EFFECT OF OIL POLLUTION ON ROCKY SEASHORES

Nelson-Smith, A. 1979.

Monitoring the Marine Environment: Proceedings of a Symposium, London, 28-29 September 1978. D. Nichols (ed.) London, Institute of Biology, 1979. (Symposia of the Institute of Biology, No. 24). p. 25-53.

Monitoring, Environmental effects, Shorelines, Coasts, *Rocky seashores

Summary not available.

[from Marine Pollution Research Titles 6(10):#1838. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

1. Detection and Monitoring

80A-0026

THE DEVELOPMENT OF TECHNIQUES FOR THE DETECTION AND TRACKING OF OIL IN ICE INFESTED WATERS

O'Neil, R.A., R.A. Neville, and V. Thomson. 1978.

AMOP Technical Seminar, 15-17 March 1978, Ottawa, Canada. Department of Fisheries and Environment, Environmental Protection Service, 1978, Proceedings. p. 205-222.

Movement, Detection, Monitoring, Ice, Remote sensing, Design-engineering, Performance testing

Summary not available.

[from RESORS, Canada Centre for Remote Sensing Database:#1018899. 1980]

80A-0027

DETECTION OF NAPHTHALENE BY THE BLUE CRAB, CALLINECTES SAPIDUS

Pearson, W.H. and B.L. Olla. 1979.

Estuaries, Vol. 2:64-65.

Crustaceans, Hydrocarbons, Detection, Uptake, *Naphthalene,

*Callinectes sapidus

Summary not available.

[from Marine Pollution Research Titles 6(7):#1250. 1979]

80A-0028

OIL DETECTOR

Potter, B.M. 1978.

US Patent 4,116,045

Oil slicks, Detection, Design-engineering, Equipment, Patent

Detecting different fluids, such as oil at the surface of water, is accomplished by a specially designed heated monitoring element exposed for contact with the fluid. Details of the device are presented.

[from Petroleum Abstracts 19(36):#267,364. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

1. Detection and Monitoring

80A-0029

AN EXPERIMENTAL APPROACH TO THE DETERMINANTS OF BIOLOGICAL WATER QUALITY

Stebbing, A.R. 1979.

Philosophical Transactions of the Royal Society of London [Biology]

286:1015:465-481.

Detection, Sampling, Bioassay, Chemical analysis, Bioindicators, Water quality

A technique is described for detecting and measuring variations in seawater quality by exposing suitable organisms in the laboratory to water samples collected in the field. Preliminary experimental results indicate that volatile hydrocarbons can be removed selectively from the seawater.

80A-0030

HYDROCARBONS IN THE SURFACE WATERS OF THE MARMOT BASIN

Telang, S.A. 1978.

International Symposium on Hydrocarbons and Halogenated Hydrocarbons,

McMaster University, Ontario, 23-25 May 1978, Proceedings. p. 83-1 to 83-4.

Hydrocarbons, Seawater, Canada, Arctic, *Marmot Basin

Summary not available.

[from Kananaskis Centre for Environmental Research, University of Calgary, Alberta, Canada. Reports and Publications List, #253. September 1979]

80A-0031

THE PRESENCE OF POLLUTANT HYDROCARBONS IN ESTUARINE EPIPELIC DIATOM

POPULATIONS. 2. DIATOM SLIMES

Thompson, S. and G. Eglinton. 1978.

Estuarine and Coastal Marine Science 8(1):75-86.

Hydrocarbons, PAH, Estuaries, Distribution, GC/MS, Sediments, *Diatoms

The aliphatic hydrocarbons and polycyclic aromatic hydrocarbons of the diatom slime from the surface of an intertidal estuarine sediment were analyzed by GC/MS, and their distributions were compared with the underlying sediment and the sediment-free diatom population.

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

1. Detection and Monitoring

80A-0032

RECOVERY OF AROMATIC HYDROCARBONS FROM WATER

Voznakova, Z., M. Popl, and M. Berka. 1978.

Journal of Chromatographic Science 16(3):123-127.

Aromatic hydrocarbons, Concentrations, Analytical techniques, Chromatography

A method is described for determining traces of a great variety of organic pollutants, including C₆-C₁₃ aromatic hydrocarbons from surface waters. The hydrocarbons are stripped from the aqueous phase by a stream of inert gas, from the gaseous phase they are absorbed on a macroporous polymer sorbent and quantified by gas chromatography. "The described method is suitable for the determination of volatile organic compounds (B.P. <300°C) in water in a concentration up to 0.1 ppb."

2. Remote Sensing

80A-0033

A LASER EYE IN THE SKY MAY HELP SPOT POLLUTERS

Anon. 1979.

Chemical Week 124(24):29-31.

Oil spills, Monitoring, Detection

Laser fluorosensing is a technique that is being used to detect oil spills. Characteristic light emissions of pollutants result when they are bombarded by laser light beams. Laser fluorosensing can be used to differentiate between types of oil spilled in the ocean, but it cannot be used to estimate the extent or thickness of an oil slick. Illegal dumping of oil by tankers might possibly be monitored by using laser fluorosensing as a profiling technique.

80A-0034

LASER TO DETECT OIL SLICKS [news brief]

Anon. 1979.

Marine Pollution Bulletin 10(8):217.

Analytical techniques, Source identification, Oil slicks, Canada,
*Fluorescence

"Researchers at Canada's Centre for Remote Sensing have developed a technique that not only analyzes oil slicks in the sea from aircraft observation but which could also 'match up' a specific spill to the oil tanker responsible."

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
2. Remote Sensing

80A-0035

THERMAL OIL SLICK PICTURES [news brief]

Anon. 1978.

Marine Pollution Bulletin 9(10):256.

Remote sensing, Oil slick, *Thermal IR measurements, UK

Equipment designed by Dr. D. Telfer at the University of Lancaster, UK, may be used in conjunction with satellite monitoring of oil spills. The apparatus, which can be produced for less than L 500, converts thermal imagery into 8-color pictures from grey-shaded maps showing infrared measurements taken by satellite. Test runs indicate the potential for detecting the 1°C temperature difference between oil-covered water and surrounding colder water.

80A-0036

AN APPLICATION OF LIDARS FOR DETERMINATION OF SEA SURFACE POLLUTION BY OIL PRODUCTS [English summary]

Abramov, O.I., V.I. Yeremin, L.I. Lobor, and V.V. Polovinko. 1977.

Fizika Atmosfery i Okeana 13(3):331-336.

Contamination, Oil slicks, Sea surface, *Laser radar

Backscattering spectra were obtained under laboratory conditions and for the Bosphorus region using a laser emitting at a wavelength of 0.3472 μ . These spectra were used to determine the thickness of oil product films on water surfaces.

80A-0037

OIL SPILL IDENTIFICATION AND REMOTE SENSING

Bentz, A.P. 1978.

American Chemical Society Petroleum Chemical Division Preprints 23(3):916-929.

Source identification, Statistical analysis, Oil spills

The purpose of this article is to review the state of the art in oil spill identification and the remote sensing of oil spills. The direction taken since 1976 has been toward computerization, with digital output resulting in overwhelming amounts of data. Computer pattern recognition programs are then used to interpret the collected data.

[from Petroleum Abstracts 19(47):#270,127. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

2. Remote sensing

80A-0038

AMOCO CADIZ. REMOTE SENSING OF HYDROCARBON POLLUTION. PRELIMINARY REPORT. CHRONOLOGY AND MEANS OF ACTION.

Centre National pour l'Exploitation des Oceans, et al. 1978.

Paris, Institut Geographique Nationale, 1978. 8 p. + 8 maps.

Amoco Cadiz spill, Contamination, Coastal waters, France

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:29, #3729. 1979]

80A-0039

KERSAINT SHORE--REMOTE SENSING OF OIL SPILLS

CNEXO. 1978.

Paris, France, Institut Geographique National, 1978. 8 p.

Detection, France, Shorelines

Summary not available. [Report is available from the Institut Geographique National, 136 BIS, Rue de Grenelle, Paris 75700, France.]

[from RESORS, Canada Centre for Remote Sensing Database:#1017221. 1980]

80A-0040

PRELIMINARY RESULTS OF REMOTE SENSING OVERFLIGHTS DURING THE KURDISTAN OPERATION

Fingas, M.F. et al. 1979.

Ottawa, Canada, Department of Fisheries and Environment, Environmental Protection Service, 1979. 18 p.

Monitoring, Surveillance, *Kurdistan spill

Summary not available.

[from RESORS, Canada Centre for Remote Sensing Database:#1019442. 1980]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
2. Remote sensing

80A-0041

ASSESSMENT OF THE USE OF SPACE TECHNOLOGY IN THE MONITORING OF OIL SPILLS
AND OCEAN POLLUTION

General Electric Co. 1979.

Second Research Review, NASA Langley Research Center, 28-29 June 1979.
Philadelphia, Pennsylvania, General Electric Co., Space Division,
1979. 196 p.

Remote sensing, Monitoring, Equipment, *Space technology

Summary not available. [Report is available from General Electric Co.,
Space Division, P.O. Box 8555, Philadelphia, PA 19101.]

[from RESORS, Canada Centre for Remote Sensing Database:#1019579. 1980]

80A-0042

LAGRANGIAN DRIFTER DESIGN FOR THE DETERMINATION OF SURFACE CURRENTS BY
REMOTE SENSING

Gordon, H.H. and J.C. Munday. 1977.

Annual Remote Sensing of Earth Resources Conference, 6th, Tullahoma,
Tennessee, 29-31 March 1977. Gloucester Point, Virginia Institute of
Marine Science, 1977. 19 p.

Remote sensing, Detection, Drift, Movement, Monitoring

Summary not available. [possibly oil pollution related]

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder
and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979.
Supplement 3:3, #3475. 1979]

80A-0043

OBSERVATION OF TWO TEST OIL SPILLS WITH A MICROWAVE SCATTEROMETER AND
A SYNTHETIC APERTURE RADAR (SAR)

Hawkins, R.K. and A.L. Gray. 1979.

Ottawa, Ontario, Canada Centre for Remote Sensing, 1979. 21 p.

Remote sensing, Performance testing, Equipment, Monitoring, Detection,
Oil spills, *Scatterometer, *Radar

Summary not available. [Report is available from Canada Centre for Remote
Sensing, 2464 Sheffield Rd., Ottawa, Ontario K1A 0Y7, Canada.]

[from RESORS, Canada Centre for Remote Sensing Database:#1019265. 1980]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
2. Remote sensing

80A-0044

REMOTE SENSING APPLIED TO ENVIRONMENTAL POLLUTION DETECTION AND MANAGEMENT
(A BIBLIOGRAPHY WITH ABSTRACTS)

Hundemann, A.S. 1979.

Report NTIS/PS-79/0842/9SL. Supersedes NTIS/PS-78/0789. 176 p.

Remote sensing, Bibliographies detection, Monitoring, Pollution control, Estuaries

Topic areas include pollutant characteristics, pollutant transport, remote sensing of estuarine problems, and monitoring of oil spills. This updated bibliography contains about 170 abstracts.

80A-0045

AN ANALYSIS OF DIGITAL LANDSAT TECHNIQUES FOR THE DETECTION AND MAPPING
OF THE SCOTT INLET

Kirby, M.E. 1979.

Ottawa, Ontario, Canada, Intera Environmental Consultants, Ltd., 1979.
43 p.

Remote sensing, Natural seepage, Arctic, Detection, Coastal waters, Canada

Summary not available. [Report is available from Intera Environmental Consultants, Ltd., P.O. Box 4791, Station E, Ottawa, Ontario K1S 5H9, Canada.]

[from RESORS, Canada Centre for Remote Sensing Database:#1019780. 1980]

80A-0046

TRANSFER INSTALLATION AND OIL SURVEILLANCE SYSTEM (AOSS II) IN A HC-130B
AIRCRAFT

Meeks, D.C., J.J. Bommarito, R.S. Schwantje, and A.T. Edgerton. 1977.
US Coast Guard, Office of Research and Development, Report No. CG-D-60-77,
Final report. 161 p.

Remote sensing, USCG, Surveillance, Equipment, Design-engineering,
*AOSS II

Modifications to the title system include (1) addition of a high resolution aerial reconnaissance camera, (2) addition of dual look (right and left) capability for the SLAR, (3) automatic SLAR target positioning, (4) airborne remote temperature measurement capability, (5) simultaneous multispectral recording capability for the IR-UV line scanner data, and (6) improved processing for passive microwave imager data. With these changes, AOSS II provides a unique and valuable system to support USCG missions.

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
2. Remote sensing

80A-0047

AN ANALYSIS OF OIL POLLUTION IN THE STRAITS OF TSURUSHIMA BY REMOTE SENSING
[English summary]

Ochiai, H., Y. Suzuki, and S. Takeuchi. 1978.

Project Report-1, 1978, Related to Shipbuilding and Sea State, Japan Research Committee of Environmental Remote Sensing. Minato-ku, Japan, Japanese Foundation for Shipbuilding Advancement, 1978. 4 p.

Remote sensing, Detection, Distribution, Contamination, Japan, *Straits of Tsurushima

Summary not available. [Report is available from the Japanese Foundation for Shipbuilding Advancement, Senpaku Shinko Building 4F, 1-15-16 Toranomon, Minato-ku, Japan.]

[from RESORS, Canada Centre for Remote Sensing Database:#1016999. 1980]

80A-0048

TIME-RESOLVED LASER FLUOROSENSORS: A LABORATORY STUDY OF THEIR POTENTIAL IN THE REMOTE CHARACTERIZATION OF OIL

Rayner, D.M. and A.G. Szabo. 1978.

Applied Optics 17(10):1624-1630.

Remote sensing, Crude oil, Petroleum products, Source identification, *Laser Fluorosensors

The fluorescence decay profiles have been determined for a number of light, crude and heavy oils to assess their utility in remote characterization and identification of oil spills by way of the title method. The light oils were found to have longer decay constants than those of heavy oils which have decay functions with a lifetime less than one nanosecond.

[from Petroleum Abstracts 19(48):#270,338. 1979]

80A-0049

IMPLEMENTATION OF AN ALGORITHM FOR THE USE OF OIL SPILLS ON WATER

Stroud, R.O. 1977.

Development of an Active Spill Detection System (ASDS) for Remote Detection of Oil Spills, Appendix C. Washington, DC, US Coast Guard, Office of Research and Development, 1977. 143 p.

Remote sensing, Simulations, Detection, *Algorithms

Summary not available.

[from RESORS, Canada Centre for Remote Sensing Database:#1019657. 1980]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

2. Remote sensing

80A-0050

MONITORING ENVIRONMENTAL POLLUTION BY REMOTE SENSING

Vass, P.A. and J.L. Van Genderen. 1978.

International Symposium on Remote Sensing of Environment, 12th, Manila, Philippines, 20-26 April 1978. Vol. 1:219-234.

Remote sensing, Contamination, Monitoring, Surveillance

Summary not available. [possibly oil pollution related]

[from RESORS, Canada Centre for Remote Sensing Database:#1017420. 1980]

3. Sampling and Analysis

80A-0051

LABORATORY AND FIELD STUDIES ON THE LONG-TERM EFFECTS OF PETROLEUM HYDROCARBONS ON BENTHIC MARINE INVERTEBRATES

Anderson, J.W., R. Riley, R.M. Bean, J.W. Blaylock, and S.L. Kiesser. 1977.

Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems. C. Hall and W. Preston (eds.). Report EPA/600/7-77/111. p. 107-131.

Analytical techniques, Crude oil, Hydrocarbons, Benthos, Invertebrates, Chronic effects, Depuration, Chromatography, GC/ms

This paper reports on analytical techniques being used to separate, identify, and quantitate the components of Prudhoe Bay crude oil in laboratory and field depuration studies. Methods discussed employ liquid-column chromatography, capillary-column chromatography, gas chromatography-mass spectrometry, high-performance liquid chromatography, and infrared spectroscopy. Preliminary experimental results are presented and discussed.

80A-0052

CONTAMINANTS AND SEDIMENTS. VOLUME II - ANALYSIS, CHEMISTRY, BIOLOGY

Baker, R.A. (ed.). 1980.

Ann Arbor, Michigan, Ann Arbor Science Publishers, Inc., 1980. 650 p.

Fate, Hydrocarbons, Chemical analysis, Sampling, Distribution, Analytical techniques

This two-volume treatise represents an interdisciplinary approach to defining the complex relationships involving sediments and contaminants in aqueous systems. Fundamental processes, field applications, regulatory aspects, and toxicological considerations are defined and discussed. This volume emphasizes analytical techniques and approaches, chemical processes and interactions, and biological aspects of the fate and distribution of pollutants, including hydrocarbons, in sediments.

[from Ann Arbor Science Publishers' Science Previews, Spring 1980. p. 5]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0053

APPLICATION OF TRACE ANALYTICAL TECHNIQUES TO A STUDY OF HYDROCARBON COMPOSITION UPON DISPERSION OF PETROLEUM IN A FLOWING SEAWATER SYSTEM
Bean, R.M., J.W. Blaylock, and R.G. Riley. 1978.
American Chemical Society, Petroleum Chemical Division Preprints
23(3):902-908.

Aromatic hydrocarbons, Analytical techniques, Chromatography, Seawater, Concentrations, Crude oil

The title study included such methods as a helium equilibration gas chromatography to determine volatile aromatic components. Less volatile hydrocarbons were sampled by using capillary gas chromatography. It was found that certain components are present in seawater dispersions in much higher concentrations than would be predicted from their concentration in the crude oil.

[from Petroleum Abstracts 19(47):#270,126. 1979]

80A-0054

POLYCYCLIC AROMATIC HYDROCARBON LEVELS IN EASTERN ONTARIO DRINKING WATERS, 1978

Benoit, F.M., G.L. LeBel, and D.T. Williams. 1979.
Bulletin of Environmental Contamination and Toxicology 23(6):774-778

Chemical analysis, Concentrations, PAH, Oxidation, Freshwater, Groundwater, Canada, *Ontario

"The drinking waters of 5 municipalities in Eastern Ontario were monitored for 12 selected low molecular weight polycyclic aromatic hydrocarbons (PAH) and 4 oxygenated PAH derivatives (O-PAH) using Amberlite XAD-2 macroreticular resin for analysis at the ng/L level." The results of the study are tabulated. [possibly oil pollution related]

80A-0055

SIMPLE, CONTINUOUS-FLOW SYSTEMS FOR DISSOLVING THE WATER-SOLUBLE COMPONENTS OF CRUDE OIL INTO SEAWATER FOR ACUTE OR CHRONIC EXPOSURE OF MARINE ORGANISMS
Benville, P.E., Jr. 1977.

Environmental Assessment of the Alaskan Continental Shelf, Vol. XII. Effects. National Oceanic and Atmospheric Administration, Outer Continental Shelf Environmental Assessment Program. p. 679-748.

Crude oil, Solution, WSF, Seawater, Biological effects, Marine organisms
Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979, Supplement 3:15, #3592. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

3. Sampling and Analysis

80A-0056

POLYNUCLEAR AROMATIC AND POLYCYCLIC ALIPHATIC HYDROCARBONS IN SEDIMENTS FROM THE ATLANTIC OUTER CONTINENTAL SHELF

Bierl, R.H., M.K. Cueman, C.L. Smith, and C.-W. Su. 1979.

Recent Advances in Environmental Analysis. R.W. Frei (ed.), New York, Gordon and Breach Science Publishers, 1979. p. 319-336.

Chemical analysis, Sampling, PAH, Atlantic Coast, OCS, Sediments, Hydrocarbons

Sediments from the areas between New Jersey and Virginia contain a variety of PNA's superimposed on complex mixtures of petroleum and biogenic hydrocarbons. The PNA's typically at ng/g levels (dry weight) and it is likely that they derive from pyrogenic sources. [possibly oil pollution related]

80A-0057

HYDROCARBON CHEMISTRY OF THE WATER COLUMN OF GEORGES BANK AND NANTUCKET SHOALS, FEBRUARY - NOVEMBER 1977

Boehm, P.D., G. Perry, and D. Fiest. 1978.

In the Wake of the Argo Merchant, University of Rhode Island, 11-13 January 1978. University of Rhode Island Center for Ocean Management Studies, 1978. p. 58-64.

Chemical analysis, Hydrocarbons, Seawater, Georges Bank, Atlantic Ocean

Summary not available.

[from Marine Pollution Research Titles 6(7):#1196. 1979]

80A-0058

CHEMICAL ANALYSIS OF DISPERSED OIL IN THE WATER COLUMN

Brown, C.W., P.F. Lynch, and M. Ahmadjian. 1977.

University of Rhode Island, Department of Chemistry. 20 p.

Chemical analysis, Hydrocarbons, Dispersion, Dispersants, Concentrations

"Water column samples from treated and untreated experimental spills into 6 m-deep test tanks were analyzed for hydrocarbons. The concentration of oil in the water just beneath the surface was initially 27 times greater when a dispersant was used; however, during a 3-day experiment, the amount of oil in the water column decreased significantly in both the treated and untreated case 5. When a dispersant was used, the maximum hydrocarbon concentration in the water column gradually moved toward the bottom of the tank."

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

3. Sampling and Analysis

80A-0059

DEVELOPMENT OF A SIMPLE, RAPID FIELD TECHNIQUE FOR ESTIMATING OIL CONCENTRATIONS IN THE SEDIMENTS

Brown, L.R. 1977.

US Coast Guard, Office of Research and Development, Report No. CG-D-27-77, 22 p.

Sampling, Concentrations, Sediments, Coasts, Beaches

Summary not available.

[from Marine Pollution Research Titles 5(11):#1895. 1978]

80A-0060

EXTRACTABLE ORGANICS AND HYDROCARBONS IN THE MEDITERRANEAN SEA

Brown, R.A. and H.L. Huffman, Jr. 1979.

Marine Pollution Bulletin 10(10):291-298.

Hydrocarbons, Tankers, Concentrations, Sampling, Mediterranean Sea

The title study was conducted after the reopening of the Suez Canal, which led to an increase of tanker traffic in the Mediterranean. Samples were collected along tanker routes and the total dispersed extractable organics and nonvolatile hydrocarbons were measured. Results of this study and of one done prior to reopening of the Canal are compared.

80A-0061

CHEMICAL COMPOSITION OF SELECTED ENVIRONMENTAL AND PETROLEUM SAMPLES FROM THE AMOCO CADIZ

Calder, J.A., J. Lake, and J.L. Laseter. 1978.

The Amoco Cadiz Oil Spill, a Preliminary Scientific Report. W.N. Hess (ed.), Boulder, Colorado, National Oceanic and Atmospheric Administration, Environmental Research Laboratories, 1978. p. 21-84.

Chemical analysis, Crude oil, WSF, Seawater, Amoco Cadiz spill

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:28, #3722. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0062

OCCURRENCE OF TETRAALKYLLEAD COMPOUNDS IN THE AQUATIC ENVIRONMENT

Chau, Y.K., P.T.S. Wong, O. Kramar, G.A. Bengert, et al. 1980.
Bulletin of Environmental Contamination and Toxicology 24(2):265-269.

Sampling, Freshwater, Fish, Sediments, Vegetation, Distribution,
Contamination, Concentrations, *Tetraalkyllead compounds

An extensive survey of environmental samples (fish, vegetation, sediment and water) from various lakes and rivers in Ontario was carried out to determine the presence of tetraalkyllead compounds. This study presents the results of the survey; tetraalkyllead compounds were found only in fish samples. [possibly oil pollution related]

80A-0063

TRACE ANALYSIS OF OIL IN SEAWATER BY FLUORESCENCE SPECTROSCOPY

Cretney, W.J., et al. 1977.
Pacific Marine Science Report 77(5):

Chemical analysis, Spectroscopy, Seawater

Summary not available.

[from Underwater Information Bulletin 9(5):35; #7710/1339. 1977]

80A-0064

MANUAL ON THE DISCRIMINATION OF BIOGENIC AND MINERAL OIL COMPOUNDS

[in German]

Deutsche Gesellschaft fuer Mineraloelwissenschaft und Kohlenchemie. 1977.
Hamburg, DGMK, 1977, Research Report 150. 44 p.

Analytical techniques, Biogenic hydrocarbons, Petroleum products, Manuals,
*Discrimination

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:20, #3643. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0065

TAR BALL CONCENTRATIONS IN THE OCEAN AROUND THE CAPE OF GOOD HOPE BEFORE AND AFTER A MAJOR OIL SPILL

Eagle, G.A., A. Green, and J. Williams. 1979.

Marine Pollution Bulletin 10(11):321-324.

Monitoring Africa, Tar, Distribution, Sampling, Concentrations

Measurement of tar ball concentrations of samples taken on twelve monthly cruises from 120 stations around the Southwestern Coast of South Africa shows that this area is relatively free of floating tar. Occurrence of a tanker spill enabled a research team to monitor movement of tar balls, concluding that "under influence of currents and winds tar balls move long distances and residence time in the ocean is estimated at one year".

80A-0066

TRACE ANALYSIS OF POLLUTANTS IN RAINWATER AT GOA

Fondekar, S.P. and R.S. Topgi. 1979.

Mahasagar 12(1):49-51

Concentrations, Hydrocarbons, Chemical analysis, Freshwater, *Goa

"Two rainwater samples were collected in the Goa region during the period June-July, 1977. Both the samples were analyzed for traces of metals and one sample for petroleum hydrocarbons. The concn. of petroleum hydrocarbons was 22 $\mu\text{g/L}$."

[from Chemical Abstracts 91():#145,272d. 1979]

80A-0067

3,4-BENZOPYRENE AND PERYLENE IN MUSSELS, MYTILUS SP., FROM THE LAGUNA VENETA, NORTHEAST ITALY

Fossato, V.U. et al. 1979.

Marine Environmental Research 2(1):47-54.

Chemical analysis, Detection, Concentrations, PAH, Mollusks, *Mussels

Polycyclic aromatic hydrocarbon pollution in the Laguna Veneta area was studied through measurement of the levels of 3,4-benzopyrene (BaP) and perylene (Pe) in mussels. The mean concentration of BaP was in the range of 12.0-135.1 $\mu\text{g/kg}$ dry weight and 1.5-16.9 $\mu\text{g/kg}$ for Pe. Most of these substances in the mussels are of anthropogenic origin.

[from Environment Abstracts 9(10):#79-05672. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

3. Sampling and Analysis

80A-0068

SPECIAL ENVIRONMENTAL REPORT NO. 6 - DETERMINATION OF THE ATMOSPHERIC CONTRIBUTION OF PETROLEUM HYDROCARBONS TO THE OCEANS

Garrett, W.D. and V.M. Smagin. 1977.

Geneva, Switzerland, Secretariat of the World Meteorological Organization, 1977. 27 p.

Sampling, Detection, Sources, Marine environment, Hydrocarbons,
*Atmospheric inputs

Summary not available. [possibly oil pollution related]

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:2, #3469. 1979]

80A-0069

QUANTIFICATION OF PETROLEUM-TYPE HYDROCARBONS IN AVIAN TISSUE

Gay, M.L., A.A. Belisle, and J.F. Patton, 1980.

Journal of Chromatography, [187(1):153-160].

Analytical techniques, Hydrocarbons, Birds, Chromatography, Spectroscopy,
*Mallard ducks

Methods were developed for the analysis of 16 hydrocarbons in avian tissue. Mechanical extraction with pentane was followed by cleanup on Florisil and Silicar. Residues were determined by gas-liquid chromatography and gas-liquid, chromatography-mass spectrometry. The method was applied to the analysis of liver, kidney, fat, and brain tissue of mallard ducks (*Anas platyrhynchos*) fed a mixture of hydrocarbons. Measurable concentrations of all compounds analyzed were present in all tissues except brain. Highest concentrations were in fat.

80A-0070

DETERMINATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN THE ENVIRONMENT BY GLASS CAPILLARY CHROMATOGRAPHY

Giger, W. and C. Schaffner. 1978.

Analytical Chemistry 50(2):243-249

Chemical analysis, Chromatography, PAH, Sampling

Samples of PAH's were isolated by a sequence of steps involving solvent extraction, gel filtration, and adsorption chromatography. Quantifiable individual PAH components were separated out by glass capillary gas chromatography using 20 m long capillaries coated with SE-52. [possibly oil pollution related]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0071

THE EKOFISK BRAVO BLOWOUT: DETERMINATION OF PETROLEUM HYDROCARBONS IN THE WATER

Grahl-Nielsen, O., K. Westrheim, and S. Wilhelmsen. 1977.
International Committee for Exploration of the Sea, ICES C.M. Pap. Rep., Report No. C.M. 1977/E:55. p. 3:1-3:13.

Ekofisk blowout, North Sea hydrocarbons, Seawater, Detection, Concentrations, Sampling

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:32, #3760. 1979]

80A-0072

HIGH PRESSURE LIQUID CHROMATOGRAPHIC DETERMINATION OF POLYNUCLEAR AROMATIC HYDROCARBONS IN OYSTERS

Hanus, J.P., H. Guevvero, E.R. Biehl, and C.T. Kenner. 1979.
Journal of the Association of Official Analytical Chemists 62(1):29-35.

Chemical analysis, Chromatography, Aromatic hydrocarbons, Mollusks, *Oysters

The title procedure was used to determine 13 polynuclear aromatic hydrocarbons (PNA's) in oysters at the 2 ppb level. The method provides a sensitive and selective analysis for the 13 PNA's studied and may be useful in oil spill-related studies.

[from Waste Materials Biodegradation Research Titles 6(3):#79/3-UU-2439, p. 64. 1979]

80A-0073

QUANTITATIVE ANALYSIS OF RESIDUAL FUEL OIL IN SEDIMENT SAMPLES BY ABSORPTION SPECTROPHOTOMETRY

Hennig, H.F-K.O. 1979.
Marine Pollution Bulletin 10(8):234-37.

Sampling, Spectrometry, Sediments, Monitoring, *South Africa

A spectrophotometric technique for the analytical determination of oil in sediment samples is described. Field samples from Victoria Bay on the south coast of Southern Africa were used in the experiment.

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0074

THE NBS PROGRAM FOR STANDARDS FOR TRACE ORGANIC ANALYSIS IN THE MARINE ENVIRONMENT

Hertz, H.S., S.N. Chesler, W.E. May, S.A. Wise, et al. 1977.

Chemical analysis, Hydrocarbons, Sediments, Marine environment, Concentrations, *National Bureau of Standards

"The National Bureau of Standards (NBS) is currently conducting a research program to develop standards for trace organic analysis in the marine environment. In this paper, we summarize the results of these analyses for petroleum-in-sediment and petroleum-in-biota reference materials, marker compounds, and concentration techniques for polar organic materials."

80A-0075

DISTRIBUTION AND ABUNDANCE OF HYDROCARBON DEGRADING BACTERIA IN WESTERN NORTH PACIFIC OCEAN, EASTERN INDIAN OCEAN AND SOUTH CHINA SEA [English summary]

Higashihara, T. and A. Sato. 1979.

Bulletin of the Japanese Society of Scientific Fisheries 45(4):473-483.

Distribution, Hydrocarbons, Bacteria, Biodegradation, Pacific Ocean, Indian Ocean, *South China Sea

Numerous stations in the title regions were sampled for horizontal and vertical distributions of bacteria in seawater, and for their abundance in bottom sediments. "It was demonstrated that in the regions studied there was no positive correlation between the distribution of hydrocarbon degrading bacteria and the occurrence of petroleum hydrocarbons in the environment."

80A-0076

INTERLABORATORY COMPARISON OF ANALYSES FOR TRACE LEVEL PETROLEUM HYDROCARBONS IN MARINE SEDIMENTS

Hilpert, L.R., W.E. May, S.A. Wise, S.N. Chesler, and H.S. Hertz. 1977. Environmental Assessment of the Alaskan Continental Shelf. Vol. XIII. Containment Baselines. NOAA Outer Continental Shelf Assessment Program, 1977. p. 15-38.

Chemical analysis, Hydrocarbons, Detection, Sediments, *Interlaboratory comparisons

"Results of the determination of petroleum hydrocarbons at the $\mu\text{g/kg}$ (ppb) level in marine sediments have been compared among eight laboratories. Values for concentrations of total extractable hydrocarbons scattered between 9 to 500 $\mu\text{g/kg}$ and 49 to 6625 $\mu\text{g/kg}$ for the two sites examined. Scatter of results for hydrocarbons in the gas chromatographic elution range, the most abundant aliphatic and aromatic hydrocarbons, and total polynuclear aromatic hydrocarbons (four rings and larger) were similar. . . The data are discussed with regard to the reliability and comparability of current methods for environmental baseline measurements."

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0077

HYDROCARBONS IN SEDIMENTS

Hodgson, G.W. 1978.

Encyclopedia of Earth Sciences, Vol. VI. R.W. Fairbridge and J. Bourgeois (eds.). Dowden, Hutchinson and Ross, Inc., 1978. p. 404-405.

Hydrocarbons, Sediments, Sampling, Concentrations, Distribution

Summary not available.

[from Kananaskis Centre for Environmental Research, University of Calgary, Alberta, Canada. Reports and Publications List, #233, p. 7. September 1979]

80A-0078

COMPARISON OF UV FLUORESCENCE AND GAS CHROMATOGRAPHIC ANALYSES OF HYDROCARBONS IN SEDIMENTS FROM THE VICINITY OF THE ARGO MERCHANT WRECK SITE

Hoffman, E.J., J.G. Quinn, J.R. Jadamec, and S.H. Fortier. 1979

Bulletin of Environmental Contamination and Toxicology 23(4/5):536-543.

Chemical analysis, Concentrations, Hydrocarbons, Sediments, Chromatography, *UV Fluorescence, Argo Merchant spill

The purpose of the title study was to provide an opportunity to compare, using actual field samples from the title wreck site, two different analytical techniques for determining sediment petroleum hydrocarbon concentrations. References are included that discuss the environmental significance of this study.

80A-0079

NUMERICAL TAXONOMIC STUDIES ON BACTERIA SELECTED FOR ABILITY TO UTILIZE HYDROCARBONS FROM ARCTIC AQUATIC ECOSYSTEMS EXPOSED TO CRUDE OR REFINED OIL

Horowitz, A., M.I. Krichevsky, and R.M. Atlas. 1978.

American Society for Microbiology, 78th Annual Meeting, Las Vegas, Nevada, 1978. R. Slepecky (ed.). Washing, D.C., American Society for Microbiology, 1978, Abstract No. Q80. p. 208.

Biodegradation, Bacteria, Arctic, Seawater, Freshwater, Ecosystems, Contamination, Crude oil, Gasoline, Statistical analysis

"Numerical taxonomie studies were performed on 243 psychrotrophic isolates from an Arctic freshwater lake contaminated with leaded gasoline and from Arctic coastal seawater exposed to Prudhoe Bay crude oil." Strains were examined for 127 phenotypic features and results are presented.

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0080

SIMULTANEOUS FLUORESCENCE EXCITATION AND EMISSION TECHNIQUES TO SEPARATE POLYAROMATIC HYDROCARBON MIXTURES

Jadamec, J.R., D.R. Pack, Jr., and A. Ganz. 1980.

Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 31st, Pittsburgh, Pennsylvania, 10-14 March 1980, Paper 168.

Chemical analysis, PAH, *Fluorescence excitation and emission

Summary not available. [possibly oil pollution related]

[from Applied Spectroscopy 34(1):115. 1980]

80A-0081

CHARACTERIZATION OF ORGANIC MATTER IN SEDIMENTS FROM GULF OF ALASKA, BERING AND BEAUFORT SEAS

Kaplan, I.R., W.E. Reed, M.W. Sandstrom, and M.I. Venkatesan. 1977.

Environmental Assessment of the Alaskan Continental Shelf. Vol. XIII. Contaminant Baselines. National Oceanic and Atmospheric Administration, Outer Continental Shelf Environmental Assessment Program. p. 751-787.

Chemical analysis, Sediments, Gulf of Alaska, Bering Sea, Beaufort Sea

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:24, #3682. 1979]

80A-0082

GAS CHROMATOGRAMS OF HEXANE FRACTIONS EXTRACTED FROM SURFACE SEDIMENTS OF EAST BERING SEA AND GULF OF ALASKA

Kaplan, J.R., W.E. Reed, M.W. Sandstrom, and M.I. Venkatesan. 1977.

Environmental Assessment of the Alaskan Continental Shelf. Vol. XIII. Contaminant Baselines. National Oceanic and Atmospheric Administration, Outer Continental Shelf Environmental Assessment Program. p. 788-822.

Chemical analysis, Chromatography, Sediments, Gulf of Alaska, Bering Sea

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:24, #3683. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

3. Sampling and Analysis

80A-0083

SAMPLING PROBE FOR SAMPLES OF HYDROCARBONS IN POLLUTED WATER [in French]

Kerouel, R. and J.L. Carsin. 1977.

IIIes Journees d'Etudes sur les Pollutions Marines. . . Protection du Littoral Mediterranee. Commission Internationale pour l'Exploration Scientifique de la Mer Mediterranee., 1977. p. 223-224.

Hydrocarbons, Contamination, Sampling

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:16, #3602. 1979]

80A-0084

THE GLOBAL DISTRIBUTION OF POLYCYCLIC AROMATIC HYDROCARBONS IN RECENT SEDIMENTS

Laflamme, R.E. and R.A. Hites. 1978.

Geochimica et Cosmochimica Acta 42(3):289-303.

Distribution, Concentrations, PAH, Sediments, *Combustions, Sources,
*Urban centers

The qualitative polycyclic aromatic hydrocarbon (PAH) distribution pattern in sediments is remarkably constant for the locations studied. Total PAH abundance increases with proximity to urban centers. This is consistent with anthropogenic combustion being the major source of these compounds. It was found that the PAH in sediments could not originate directly from petroleum.

80A-0085

PETROLEUM HYDROCARBON ANALYSES CONDUCTED FOLLOWING THE WRECK OF THE SUPERTANKER AMOCO CADIZ

Law, R.J. 1978.

Marine Pollution Bulletin 9(11):293-296.

Amoco Cadiz spill, Sampling, Seawater, Sediments, Analytical techniques, France, English Channel

Samples of water, sediment, and oil were collected between April and June 1978, from the Brittany coast and the western English Channel for analysis. A review is presented of the sampling techniques, the analytical techniques and results.

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0086

EARLY SAMPLES OF OIL IN WATER AND SOME ANALYSES OF ZOOPLANKTON

Mackie, D.R., R. Hardy, E.I. Butler, P.M. Holligan, and M.F. Spooner. 1978.

Marine Pollution Bulletin 9(11):296-297.

Amoca Cadiz spill, Sampling, Chemical analysis, Zooplankton, Aromatic hydrocarbons

Results of water sample analyses from around the Amoco Cadiz wreckage collected on 23-24 March 1978 are presented. Nine samples were taken within the slick and two before and after entering the polluted area. Zooplankton samples were analyzed for aromatic content and percentage of copepods showing fluorescence in tissues. Results ranged from very high to very low, directly related to the distance from the wreck.

80A-0087

METABOLIC FATE OF AROMATIC HYDROCARBONS IN AQUATIC ORGANISMS: ANALYSIS OF METABOLITES BY THIN-LAYER CHROMATOGRAPHY AND HIGH-PRESSURE LIQUID CHROMATOGRAPHY

Malins, D.C., T.K. Collier, L.C. Thomas, and W.T. Roubal. 1979.

International Journal of Environmental Analytical Chemistry 6(1):55-66.

Chemical analysis, Chromatography, Aromatic hydrocarbons, Fish, Metabolism, *Metabolites

The title analytical techniques were used to study the bioconversion of aromatic petroleum hydrocarbons in aquatic organisms. The application of radiometric techniques has revealed a variety of metabolites. Results of the study are discussed.

80A-0088

BENZO (A) PYRENE CONCENTRATIONS IN MUSSELS (MYTILUS EDULIS) FROM YAQUINA BAY, OREGON DURING JUNE 1976 - MAY 1978

Mix, M.C. and R.L. Schaffer. 1979.

Bulletin of Environmental Contamination and Toxicology 23(4/5):677-684.

Concentrations, PAH, Petroleum products, Carcinogens, Uptake, Mollusks, Oregon *Mussels

Oil derivatives, particularly refined oils, are found to contain low levels of benzo (a) pyrene (BAP) and several other polynuclear aromatic hydrocarbons which are carcinogenic in invertebrates. This study monitored indigenous populations of mussels for a two year period to measure BAP concentrations, determine seasonal fluctuations in BAP body burdens, and analyze factors that may influence temporal concentration patterns.

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

3. Sampling and Analysis

80A-0089

PRELIMINARY RESULTS OF THE PETROLEUM POLLUTION BY THE AMOCO CADIZ: LEVELS OF TOTAL HYDROCARBONS IN SEAWATER, FROM THE BAY OF BREST TO NEAR THE ISLAND OF COTENTIN MARCH - APRIL 1978 [in French]

Morel, G. and P. Courtot. 1978.

Actes des Colloques du Centre National pour l'Exploitation des Oceans, No. 6:39-50.

Concentrations, Hydrocarbons, Seawater, Amoco Cadiz spill, Bays, Coasts, France

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:31, #3745. 1979]

80A-0090

QUANTITATION OF SULFUR-CONTAINING OIL COMPOUNDS AND POLYCHLORINATED BIPHENYLS (PCB's) IN SEDIMENTS FROM WATERS OF THE OSAKA PORT AREA

Nakamura, A. and T. Kashimoto. 1979.

Archives of Environmental Contamination and Toxicology 8(5):563-571.

Chemical analysis, Sediments, Ports, Contamination, Japan *Osaka Port

Sediments were periodically collected from the waters of the Osaka Port area during the period of 1970 to 1977 and analyzed for oil pollutants and polychlorobiphenyls (PCB's). Sulfur-containing oil components and PCB's were most noticeable in the vicinity of the mouth of the Shirinashi River and they originated from discharges and/or dumping into the river. Analyses indicated that the sulfur-containing materials were derived from a Class C heavy oil, and were present in the sediments in a range of 0.49 to 7.5 ppm (dry basis).

[from Marine Pollution Research Titles 7(2):#311. 1980]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

3. Sampling and Analysis

80A-0091

IDENTIFICATION OF ORGANIC SULFUR COMPOUNDS TRANSFERRED TO FISH FROM PETROLEUM SUSPENSION BY MASS CHROMATOGRAPHY

Ogata, M. and Y. Miyake. 1979.

Water Research 13(12):1179-1185.

Uptake, Fish, Contamination, Crude oil, Chemical analysis, GC/MS,

*Organic sulfur compounds

Organic sulfur compounds usually contained in crude oil were selected as a marker of oil pollution in fish. To confirm this, eels (Anquilla japonica) were maintained in a controlled laboratory environment in water with suspensions of crude oil. Gas chromatography-mass spectrometry and mass chromatography of eel flesh extract showed the presence of organic sulfur compounds of alkyl- (from mono- to pentamethyl) benzo-thiophenes, dibenzothiophene and alkyl- (from mono- to trimethyl) dibenzothiophene and other organic sulfur compounds of alkyl- (from mono- to pentamethyl) naphthalene.

[from Petroleum Abstracts 20(19):#275,783. 1980]

80A-0092

IDENTIFICATION OF SUBSTANCES TRANSFERRED TO FISH OR SHELLFISH FROM PETROLEUM SUSPENSION

Ogata, M., Y. Miyake, and Y. Yamasaki. 1979.

Water Research 13(7):613-618.

Chemical analysis, Hydrocarbons, Fish, Mollusks, *Sulfur compounds,

*Suspensions

Identification of organic sulfur compounds contained in crude oil as a marker of oil pollution of fish and shellfish was performed, using eels (Anquilla japonica) and short-necked clams (Tapes Amygdala philippinarum). GC/MS analysis of tissues was performed, and the compounds thus isolated are identified.

80A-0093

PRESENT CONDITION AND MEASURE FOR POLLUTION OF SEAWATER BY HAMACHI RAISING

Onishi, T., M. Makada, and H. Sakamoto. 1978.

Scientific Reports of Kagoshima University, No. 27:115-121.

Sampling, Monitoring, Contamination, Seawater, Japan

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:17, #3615. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0094

DISTRIBUTION OF AROMATIC HYDROCARBONS IN SEDIMENTS FROM SELECTED ATLANTIC, GULF OF MEXICO AND PACIFIC OCS AREAS

Overton, E.B. and J. L. Laseter. 1978

American Chemical Society, Petroleum Chemical Division Preprints
23(3):935-941.

Chemical analysis, Sediments, Aromatic hydrocarbons, GC/MS, Distribution, Sources

Approximately 200 near-surface sediments from the title areas were analyzed. Hydrocarbon components were extracted by reflux with hexane and benzene. The aromatic components were analyzed by high resolution gas chromatography and GC/MS methods. Correlations of aromatic types with geographic distribution and petroleum sources are discussed.

[from Petroleum Abstracts 19(47):#270,129. 1979]

80A-0095

A FIELD DEPLOYABLE FLUORESCENCE INSTRUMENT FOR THE IDENTIFICATION OF OIL AND OTHER HAZARDOUS MATERIALS

Pack, D.R., Jr., J.R. Jadamec, L.P. Giering, and J.T. Brownrigg. 1980. Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 31st, Pittsburgh, Pennsylvania, 10-14 March 1980. Paper 166.

Chemical analysis, Detection, Petroleum products, Equipment, *Field deployable instrument

Summary not available.

[from Applied Spectroscopy 34(1):115. 1980]

80A-0096

METHODS OF ANALYSIS FOR POLYNUCLEAR AROMATIC HYDROCARBONS IN ENVIRONMENTAL SAMPLES

Pancirov, R.J., T.D. Searl, and R.A. Brown. 1978.

American Chemical Society, Petroleum Chemical Division Preprints
23(3):855-869.

Oil industry, Analytical techniques, PAH, Chromatography

A review of the title subject is presented with particular emphasis of efforts within the past 10 years. In particular, a method by Exxon Research Co. employing gas chromatography peaks being trapped and measured for C^{14} radioactivity and their ultraviolet spectra. Data of samples for which the Exxon method has been applied are presented.

[from Petroleum Abstracts 19(47):#270,134. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

3. Sampling and Analysis

80A-0097

POLYNUCLEAR AROMATIC HYDROCARBONS IN MARINE TISSUES

Pancirov, R.J. and R.A. Brown. 1977.

Environmental Science and Technology 11(10):989-992.

Chemical analysis, Marine organisms, PAH, Fish, Mollusks

Shellfish and fin fish contain benzo [a] pyrene and other PAH's in the parts per billion range or below. The presence of pyrene at a much higher relative concentration than its methyl isomers indicates that the hydrocarbons are from a combustion source, whereas in petroleum PAH's, the methyl and higher alkyl-substituted isomers significantly outnumber the parent hydrocarbons. [possibly oil pollution related]

80A-0098

AN IMPROVED TECHNIQUE FOR ENUMERATING AND SCREENING HYDROCARBONODASTIC HETEROTROPHS IN MARINE ENVIRONMENTS

Passman, F.J., T.J. Novitsky, and M.E. Dawson. 1978.

American Society for Microbiology, 78th Annual Meeting, Las Vegas, Nevada, 1978. R. Slepecky (ed.). Washington, DC, American Society for Microbiology, 1978, Abstract No. N12. p. 164.

Hydrocarbons, Biodegradation, Bacteria, Marine environment, Atlantic Ocean, Sediments, Seawater, *Screening

Hydrocarbonodastic bacteria in the surface film, water column and sediments of Georges Bank were enumerated as a fraction of the total heterotrophic population. Results of sampling from 42 stations during spring and summer North Atlantic outer continental shelf cruises are presented and discussed.

80A-0099

ANALYTICAL METHODOLOGY IN ASSESSING PETROLEUM POLLUTION

Petrakis, L., D.M. Jewell, and W.F. Benusa. 1978.

American Chemical Society, Petroleum Chemical Division Preprints 23(3):870-876.

Chemical analysis, Oil industry, Analytical techniques, Biodegradation, Marine environment

This study addresses the analytical chemistry of petroleum as it has been developed and is practiced in the petroleum industry laboratory. Examples are given of a variety of techniques that demonstrate the analytical capabilities of a large petroleum research laboratory. Additionally, examples are cited from the use of these techniques in the biodegradation of petroleum in the marine environment.

[from Petroleum Abstracts 19(47):#270,135. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0100

MODIFICATION OF CONVENTIONAL GAS CHROMATOGRAPHIC INLETS FOR THE USE OF GLASS CAPILLARY COLUMNS

Ramos, L.S., D.W. Brown, R.G. Jenkins, and W.D. MacLeod, Jr. 1979.
NBS Special Publication 519 (Trace Organic Analysis: New Frontiers in Analytical Chemistry):713-718.

Chemical analysis, Chromatography, Hydrocarbons, Fish, Sediments

Modifications to the title technique are described, and as a demonstration of the new system's performance, typical gas chromatograms of hydrocarbons obtained from cod stomach extracts taken in the vicinity of an oil spill are presented, together with the arem fraction of a contaminated marine sediment.

[from Chemical Abstracts 91(23):#187,421g. 1979]

80A-0101

GAS CHROMATOGRAPHY OF HIGH MOLECULAR WEIGHT HYDROCARBONS USING AN INORGANIC SALT EUTECTIC COLUMN.

Snowdon, L.R. and E. Peake. 1978.
Analytical Chemistry, Vol. 50:379-381.

Chemical analysis, Chromatography, Hydrocarbons, Biodegradation, *Alkanes

The ratio of isoprenoids to selected normal alkanes is useful as an indicator of biochemical alteration of spilled crude oil. This article discusses the development of a packed column which completely resolves isoprenoid and normal alkanes, is easy to operate, and yields rapid analysis of a large number of samples.

80A-0102

ANALYSIS OF ORGANIC WATER POLLUTANTS BY INFRARED SPECTROSCOPY

Taft, J.B., C.P. Anderson, C.P. Evers, K. Shea, and A.P. Bentz. 1980.
Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 31st, Pittsburgh, Pennsylvania, 10-14 March 1980. Paper 167.

Chemical analysis, Spectroscopy, Contamination

Summary not available. [possibly oil pollution related]

[from Applied Spectroscopy 34(1):115. 1980]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0103

THE CONFIDENT DETERMINATION OF BENZO(A)PYRENE IN NATURAL, SYNTHETIC AND REFINED CRUDES

Tomkins, B.A. and H. Kubota. 1980.

Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 31st, Pittsburgh, Pennsylvania, 10-14 March 1980. Paper 033.

PAH, Crude oil, Petroleum products, Chemical analysis, *Benzo (a)pyrene

Summary not available. [possibly oil pollution related]

[from Applied Spectroscopy 34(1):112. 1980]

80A-0104

ENVIRONMENTAL POLLUTANTS. DETECTION AND MEASUREMENT

Toribara, T.Y., J.R. Coleman, B.E. Dahneke, and I. Feldman (eds.). 1978.

New York, Plenum Press, 1978. Proceedings of the Tenth Rochester International Conference on Environmental Toxicity, Rochester, New York, 23-25 May 1977. 500 p.

Sampling, Chemical analysis, Detection, Source identification, Contamination, Oil spills

This book contains the collected papers of a conference on modern techniques for the detection and measurement of environmental pollutants in the aquatic environment and in the atmosphere. Included is a paper on tanker spill fingerprinting by C.W. Brown and P.F. Lynch [abstracted separately in this issue of OPA] and several other papers possibly relevant to oil pollution.

80A-0105

LEVELS OF BENZO(A)PYRENE IN OIL SHALE INDUSTRY WASTES, SOME BODIES OF WATER IN THE ESTONIAN S.S.R. AND IN WATER ORGANISMS

Veldre, I.A., A.R. Itra, and L.P. Paalme. 1979.

Environmental Health Perspectives 30(June):211-216.

Sampling, Concentrations, Contamination, Oil shale, Oil industry, Wastewaters, USSR, Lakes, Rivers, *Estonia

"Data on the content of benzo(a)pyrene (BP) in oil shale industry wastewater, the effectiveness of various effluent treatment processes (evaporation, extraction with butyl acetate, trickling filters, aeration tanks) in reducing the level of BP in oil shale wastewater, the level of BP in various bodies of water of Estonia, and in fish and other water organisms are reviewed. The levels of BP in rivers of the oil shale industry region are comparatively higher than in other areas of Estonia. The BP level in lakes of Estonia is on the whole insignificant".

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

3. Sampling and Analysis

80A-0106

AZAARENES IN RECENT LAKE SEDIMENTS

Wakeham, S.G. 1979.

Environmental Science and Technology 13(9):1130-1134.

Sampling, Distribution, Sediments, Lakes, *Switzerland, *Azaarenes

Preliminary environmental implications of the presence of azaarenes in sediment taken from several Swiss lakes are discussed. The fact that azaarenes are found in surface sediments indicates that the compounds are cycled through the aquatic environment with sediments acting as a sink. [possibly oil pollution related]

[from Environment Abstracts 10(1):#80-00093. 1980]

80A-0107

POLYCYCLIC AROMATIC HYDROCARBONS IN RECENT LAKE SEDIMENTS--I. COMPOUNDS HAVING ANTHROPOGENIC ORIGINS

Wakeham, S.G., Schaffner and W. Giger. 1980.

Geochimica et Cosmochimica Acta 44(3):403-413.

Sampling, PAH, Sources, Dispersion, Sediments, Lakes, Aquatic environment

Spillage of petroleum may add to the anthropogenic contribution of PAH to recent sediments. A detailed investigation of the distributions of aromatic hydrocarbons in four lakes (three in Switzerland and one in the northwestern United States) has been made in order to assess the origins (anthropogenic and natural) and modes of dispersion (atmospheric, water-borne, etc.) of the PAH which are accumulated in recent aquatic sediments.

80A-0108

ACTIVITY-DIRECTED FRACTIONATION OF PETROLEUM SAMPLES

Warner, J.S. and J.W. Anderson. 1978.

US National Oceanic and Atmospheric Administration, Environmental Assessment of the Alaskan Continental Shelf, April-June 1978. p. 642-651.

Chemical analysis, Sampling, Hydrocarbons, *Fractionation

Summary not available.

[from Marine Pollution Research Titles 6(7):#1268. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0109

RECENT ADVANCES IN THE DETERMINATION OF PETROLEUM HYDROCARBONS IN
ZOOPLANKTON AND MACROFAUNA

Warner, J.S., R.M. Riggin, and A.P. Graffeo. 1978.

American Chemical Society, Petroleum Chemical Division Preprints
23(3):835-844.

Sampling, Detection, Analytical techniques, Aromatic hydrocarbons,
Biogenic hydrocarbons, Zooplankton, Animals

"This work addresses 2 major analytical problems in the determination of petroleum hydrocarbons in marine organisms, namely interference from biogenic hydrocarbons and inadequate detection limits using small samples." Long-chain olefins are the most troublesome, as they appear in the same fraction of a tissue extract as aromatic hydrocarbons. Use of GC/MS techniques, and high-pressure liquid chromatography using a fluorescence detector are suited for differentiating between the aromatic and biogenic fractions.

[from Petroleum Abstracts 19(47):#270,120. 1979]

80A-110

PETROLEUM HYDROCARBONS IN URBAN RUNOFF

Whipple, W., Jr. and J.V. Hunter. 1979.

Water Resources Bulletin 15(4):1096-1106.

Concentrations, Contamination, Sources, Estuaries, Crankcase oil,
Hydrocarbons, Refineries, Wastewaters, *Urban runoff

Petroleum hydrocarbon pollution levels in the Delaware Estuary were estimated by determining storm event loadings of hydrocarbons from storm sewers. Hydrocarbons in urban runoff, most of which resemble crankcase oil constitute the major source of hydrocarbon pollution in the estuary today. Refinery effluents were previously responsible for most hydrocarbon pollution, but are no longer as prevalent, due to new treatment processes.

[from Environment Abstracts 9(10):#79-05947. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
3. Sampling and Analysis

80A-0111

METHODS FOR POLYNUCLEAR AROMATIC HYDROCARBON ANALYSIS IN THE MARINE ENVIRONMENT

Wise, S.A., S.N. Chesler, H.S. Hertz, L.R. Hilpert, and W.E. May. 1978. Carcinogenesis, Vol. 3: Polynuclear Aromatic Hydrocarbons. P.W. Jones and R.I. Freudenthal (eds.). New York, Raven Press, 1978. p. 175-182.

PAH, Marine organisms, Sediments, Seawater, Analytical techniques, Detection

Procedures used at the National Bureau of Standards for the analysis of polynuclear aromatic hydrocarbons (PAHs) in water, sediments, and marine organisms are described. Volatile PAHs are removed by dynamic headspace sampling; larger PAHs are separated by a series of trace enrichment or solvent extraction techniques, followed by gas chromatography-mass spectrometry, or liquid chromatography combined with UV absorption/fluorescence emission detection. [possibly oil pollution related]

80A-0112

CHARACTERIZATION OF ENVIRONMENTAL SAMPLES FOR POLYNUCLEAR AROMATIC HYDROCARBONS BY AN X-RAY EXCITED OPTICAL LUMINESCENCE TECHNIQUE

Woo, C.S., A.P. D'Silva, and V.A. Fassel. 1980.

Analytical Chemistry 52(1):159-164.

Analytical techniques, PAH, Sampling, Source identification

"N-Heptone concentrate of the neutral fraction of coal combustion and conversion by-products and of shale and fuel oil by-products is used to obtain profiles of their polynuclear aromatic hydrocarbon content."

The technique described in this paper may provide a method for characterizing the source of unknown oil spills.

80A-0113

HYDROCARBONS IN THE MEDITERRANEAN SEA, 1974-1975

Zsolnay, A. 1979.

Marine Chemistry 7(4):343-352.

Sampling, Concentrations, Hydrocarbons, Mediterranean Sea

Hydrocarbons in the Mediterranean Sea were analyzed during the winter of 1974 to 1975, starting from one meter depth. The results of study are briefly discussed.

[from Petroleum Abstracts 19(38):#267,753. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
4. Source Identification

80A-0114

KIEL STATISTICS [news brief]

Anon. 1977.

Environmental Policy and Law 3(2):81.

Source identification, Statistics, Tankers, Natural seepage, Offshore, Onshore, Oil industry

The Institute of Marine Science in Kiel, West Germany, has released statistics on the international scope of marine oil pollution. Some 6 m tons of oil products end up in the sea every year, of which some 25,000 tons are from tanker accidents, 1.6 m tons from nonpoint onshore and inland sources, 600,000 tons from natural seepage, and 80,000 tons from offshore exploration-production. 2.1 m tons come from the operational discharges of 6000 tankers.

80A-0115

FINGERPRINTING MARINE POLLUTANT HYDROCARBONS BY COMPUTERIZED GAS CHROMATOGRAPHY-MASS SPECTROMETRY

Albaiges, J. and P. Albrecht. 1979.

Recent Advances in Environmental Analysis. R.W. Frei (ed.). New York, Gordon and Breach Science Publishers, 1979. p. 261-279.

Source identification, Sampling, GC/MS, Hydrocarbons, Weathering

It is proposed that a series of petroleum hydrocarbons of geochemical significance (biological markers) such as C_{20} - C_{40} acyclic isoprenoids and C_{27+} steranes and triterpanes be used as passive tags for the characterization of oils in the marine environment. Mass fragmentography and GC/MS techniques are described which permit differentiation of oils from the same geographic area and correlation of highly weathered samples.

80A-0116

IDENTIFYING THE SOURCE OF WEATHERED PETROLEUM: MATCHING INFRARED SPECTRA WITH CORRELATION COEFFICIENTS

Baer, C.D. and C.W. Brown. 1977.

Applied Spectroscopy 31(6):524-527.

Source identification, Analytical techniques, Chemical analysis, Weathering, Spectroscopy, *Correlation coefficients

"A novel method is presented for identifying the source of weathered petroleum by measuring the similarity between the spectrum of a weathered oil and spectra of artificially weathered samples. The Pearson correlation coefficient is used as the similarity measure, and three separate K-nearest neighbor approaches are tested on the data set.

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
4. Source Identification

80A-0117

CHEMICAL IDENTIFICATION OF OIL SPILL SOURCES

Bentz, A.P. 1978.

The Forum 13(2):425-437.

Source identification, Chemical analysis, Oil spills

Discussed in the basic US Coast Guard philosophy and technical approach to the matching of oil spills to their sources. The basic philosophy is to match the spilled oil with a sample from all suspected sources to find the best match. The technical approach, which is detailed in this article, involves sampling, sample transmittal, and interpretation and reporting of results. Basic analytical techniques used are summarized; these are fluorescence and infrared spectroscopy, gas chromatography, and thin layer chromatography.

80A-0118

WHO SPILLED THE OIL? MATCHING AN OIL SPILL WITH ITS SOURCE REQUIRES METHODS THAT TAKE INTO ACCOUNT THE WEATHERING OF OIL IN THE SPILL

Bentz, A.P. 1978.

Analytical Chemistry 50(7):655A-658A.

Source identification, Oil spills, Weathering, Analytical techniques, USCG, *Computerized pattern recognition

A review is given of the development of methods that are used by the US Coast Guard to positively identify sources of spilled oil. Comparison of weathered with unweathered oil is best done by computerized pattern recognition techniques which involve either computer ratioing of infrared spectra, or computer simulation of weathering of a given oil.

[from Marine Pollution Research Titles 5(9):#1563. 1978]

80A-0119

TANKER TRAGEDIES: IDENTIFYING THE SOURCE AND DETERMINING THE FATE OF PETROLEUM IN THE MARINE ENVIRONMENT

Brown, C.W. and P.F. Lynch. 1978.

Environmental Pollutants. Detection and Measurement. T.Y. Toribara, J.R. Coleman, B.E. Dahneke, and I. Feldman (eds.). New York, Plenum Press, 1978. Proceedings of the Tenth Rochester International Conference on Environmental Toxicity, Rochester, New York, 23-25 May 1977. p. 135-148.

Source identification, Chemical analysis, Oil discharges, Tankers, Oil spills, Chromatography, Sampling, Tar

"This paper discusses the infrared and gas chromatographic analyses of air, water, sediment and tarball samples collected at one or more of these spill sites. The chemical partitioning of these petroleum samples in the environment is discussed and the possible source of 'mystery' tarballs is conjectured based on infrared analyses."

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

4. Source Identification

80A-0120

COMPUTER TECHNIQUES FOR IDENTIFYING OIL SPILLS

Chien, Y.T. 1977.

University of Connecticut, Institute of Water Resources. 19 p.

Source identification, Analytical techniques, Oil spills, Models, Information systems, *Pattern recognition

The use of pattern recognition methods applied to oil spill identification problems was investigated. Two systems were developed. One is an interactive system capable of manipulating discrete waveforms (infrared or fluorescent spectra), and the other is a general two-dimensional pictorial information processor.

[also published in Government Reports Announcements 78(11):126. 1978]

80A-0121

IDENTIFICATION OF FUEL OILS BY LOW TEMPERATURE LUMINESCENCE SPECTROMETRY

Fortier, S.H. and D. Eastwood. 1978.

Analytical Chemistry 50(2):334-338.

Source identification, Analytical techniques, Fuel oil, Spectrometry

Low temperature luminescence was developed after optimization of experimental parameters such as solvent, sample concentration, excitation wavelength, etc. Low temperature luminescence spectra showed more structure than room temperature spectra thereby enhancing capabilities for oil spill source identification.

80A-0122

CLEANUP PROCEDURES FOR CONTAMINATED OILS PRIOR TO FINGERPRINTING BY GC AND IR SPECTROSCOPY

Frame, G.M., G.A. Flanigan, and C.P. Chamberlain. 1978.

Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 29th, Pittsburgh, Pennsylvania, March 1978. Paper 554. Abstract.

Source identification, Contamination, Analytical techniques, Chromatography, Spectroscopy

Summary not available.

[from Analytical Chemistry 50(7):658A. 1978]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
4. Source Identification

80A-0123

ON THE USEFULNESS OF SULFUR ISOTOPE RATIOS IN CRUDE OIL CORRELATIONS

Gaffney, J.S., E.T. Premuzic, and B. Manowitz. 1980.

Geochimica et Cosmochimica Acta 44(1):135-139.

Source identification, Oil spills, Chemical analysis, *Sulfur isotopes

C, S, and N stable isotope ratios have been used to identify the sources of crude oil spills.

80A-0124

POLYCYCLIC AROMATIC HYDROCARBONS IN MARINE/AQUATIC SEDIMENTS

Hites, R.A., R.E. Laflamme, and J.G. Windsor, Jr. 1978.

American Chemical Society, Petroleum Chemical Division Preprints 23(3):931-934.

Source identification, PAH, Sediments, Freshwater, Groundwater, Marine environment, GC/MS

Demonstrated in this study are PAH analytical techniques, centering on gas chromatography-mass spectrometry and its application to determining PAH sources in recent sediments. It is shown that PAH and their alkyl homologs are distributed in marine sediments throughout the world, with significant increases in proximity to urban centers.

[from Petroleum Abstracts 19(47):#270,117. 1979]

80A-0125

CONTRIBUTION OF URBAN RUNOFF TO HYDROCARBON POLLUTION

Hunter, J.V., T. Sabatino, and R. Gomperts. 1979.

Water Pollution Control Federation Journal 51(8):2129-2139.

Source identification, Chromatography, Hydrocarbons, *Urban runoff

The role of urban storm runoff in environmental loading of hydrocarbons is studied. Runoff levels were correlated with hydrocarbon loads. Sources of hydrocarbons in the runoff waters were determined through chromatographic techniques.

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION

4. Source Identification

80A-0126

CONTRIBUTION OF VOLATILE PETROLEUM HYDROCARBONS TO THE ORGANIC CARBON BUDGET OF AN ESTUARY (SOUTHAMPTON WATER)

Knap, W.H., P.J. Le B. Williams, and I. Tyler. 1979.
Nature, Vol. 279:517-519.

Source identification, Estuaries, Hydrocarbons, Industries, Oil discharges, UK, *Volatile fractions

Data accumulated during a three-year study of the Southampton Water Estuary, UK, suggest that volatile hydrocarbons from industrial effluents play a significant part in the whole carbon balance of the estuarine ecosystem. "The importance of volatile fractions of petroleum hydrocarbons with regard to industrial discharges to estuaries has been overlooked in the past."

80A-0127

ORIGINS OF POLYCYCLIC AROMATIC HYDROCARBONS IN ESTUARINE SEDIMENTS

Lake, J.L., C. Norwood, C. Dimock, and R. Bowen. 1979.
Geochimica et Cosmochimica Acta 43(11):1847-1854.

Source identification, PAH, Sediments, Estuaries, Narragansett Bay, Distribution

Chemical analyses of sediment PAHs from Narragansett Bay, Rhode Island indicate that their distribution and abundance are "best explained by a combination of input of PAHs from petroleum and combustion processes, rather than by the solubility alteration of PAH assemblages on incoming airborne material".

80A-0128

ON THE ORIGIN OF HYDROCARBONS IN MARINE ORGANISMS

Murray, J., A.B. Thomson, A. Stagg, R. Hardy, et al. 1977.
Rapport et Proces-Verbaux des Reunions. Conseil Permanent International pour l'Exploration de la Mer, Vol. 171:84-90.

Source identification, Detection, Hydrocarbons, Biogenic hydrocarbons, Marine organisms

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:2, #3471. 1979]

A. OIL POLLUTION DETECTION, ANALYSIS AND EVALUATION
4. Source Identification

80A-0129

MOLECULAR COMPOSITIONS OF WEATHERED PETROLEUM AND COMPARISON WITH ITS POSSIBLE SOURCE

Reed, W.E. 1977.

Geochimica et Cosmochimica Acta 41(2):237-247.

Source identification, Chemical analysis, Natural seepage, Crude oil, Weathering, Monitoring

"The purpose of the study was twofold: (a) to examine the compositional effects of weathering in a natural petroleum seep; and (b) to demonstrate the similarity of molecular composition between the natural petroleum seep and possible source rocks. This . . . information, together with the effects of weathering, will bear importantly on monitoring and source identification of hydrocarbon pollutants."

80A-0130

INDUSTRIAL POINT SOURCES OF PETROLEUM

Tuffey, T.J. and P. Ginsberg. 1977.

Petroleum Industry in the Delaware Estuary, A Report to National Science Foundation RANN Program (1974-1976). Appendix A. R. Patrick and W. Whipple, New Brunswick, New Jersey, Rutgers University, Water Resources Research Institute, 1977. p. 378-395.

Source identification, Contamination, Estuaries, Industries, Delaware
Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:1, #3463. 1979]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL

1. Containment

80A-0131

BARRIER FOR OIL SPILT ON WATER

Bretherick, L., D.H. Desty, and M.G. Webb. 1979.
US Patent 4,140,424.

Spill containment, Booms, Design-engineering, Equipment, Patent

An inflatable barrier consists of an air chamber and a water chamber which, when inflated, gives a figure-of-eight cross section. A pilot air tube, which facilitates laying, is quickly inflated and prevents sinking or twisting of the barrier prior to inflation of the air and water chambers.

[from Petroleum Abstracts 20(10):#273,650. 1980]

80A-0132

AIR BUBBLE DIVERTER

Canadian Petroleum Association. 1980?
Calgary, Alberta, Canadian Petroleum Association, 1980? — p.

Spill containment, Equipment, Performance testing, Rivers, Design-engineering, *Air bubble diverter

"The Canadian Petroleum Association has released the report 'Air Bubble Diverter' which describes the development and testing of a bubble barrier for diverting oil on streams. For further information contact the Canadian Petroleum Association, 1500, 6336 Avenue S.W., Calgary, Alberta T2P 2Y5."

[from Spill Technology Newsletter 5(1):4]

80A-0133

DESIGN, FABRICATION AND TESTING OF THE AIR-JET OIL BOOM

Cohen, C.H. and W.T. Lindenmuth. 1979.
NTIS Report PB80-102 635. 139 p.

Spill containment, Booms, Design-engineering, Performance testing,
*Air Jet boom

Detailed is the development and performance testing of the Air Jet oil boom, a novel boom with the capability of diverting oil slicks under wave and current conditions that preclude the deployment of more conventional booms. Even in the presence of 1.3 m harbor chop the performance is virtually unaffected.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL

1. Containment

80A-0134

GOODRICH BOOM. AN ASSESSMENT OF DESIGN CONCEPT AND GENERAL RELIABILITY
Cormack, D. and B.O. Dowsett. 1977.

Stevenage, UK, Warren Spring Laboratory, 1977. 17p.

Spill containment, Booms, Design-engineering, Performance testing, UK

Summary not available.

[from Marine Pollution Research Titles 5(1):#64. 1978]

80A-0135

BOOMS USED FOR OIL SLICK CONTROL

Lau, Y.L. and J. Moir. 1979.

Journal of Environmental Engineering 105(2):369-383.

Spill containment, Booms, Physical aspects, Oil slicks

Through lab experiments, it was determined that oil slick control through the use of a boom is impossible if the densimetric Froude number exceeds 0.5. It was also discovered that it is possible for oil to pass a barrier by being deflected downward. The average interfacial coefficient and values of the interfacial friction coefficient were calculated, using measured slick profiles.

[from Environment Abstracts 9(7):#79-04098. 1979]

80A-0136

A FEASIBILITY STUDY OF AIR SPARGING SYSTEMS FOR OIL SPILLS IN THE PRAIRIE REGION

Peake, E. and K. Burn. 1978.

Kananaskis Centre for Environmental Research, The University of Calgary, Canada. Report to the Prairie Regional Oil Spill Containment and Recovery Advisory Committee of the Canadian Petroleum Association. August 1978. 77 p.

Oil spills, Spill containment, Performance testing, Onshore, Canada, *Air sparging systems, *Feasibility study

Summary not available.

[from Kananaskis Centre for Environmental Research, University of Calgary, Alberta, Canada. Reports and Publications List. #232. p. 9. September 1979]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL

1. Containment

80A-0137

DEPLOYABLE BARRIER APRON APPARATUS FOR USE WITH CONTAMINANT RECOVERY SYSTEMS
Stagemeyer, M.D. and S.F. Allcorn. 1978.
US Patent 4,116,007.

Spill containment, Equipment, Booms, Design-engineering, Spill removal,
Patent

"A readily deployable barrier apron is described. It is used with contaminant recovery systems to encompass floating contaminant material or to channel such material to collection devices."

[from Petroleum Abstracts 19(36):#267,365. 1979]

2. Cleanup and Removal

80A-0138

CONSORTIUM ORDERS SLICKTRAIL [news brief]

Anon. 1979.

World Dredging and Marine Construction 15(8):25.

Spill cleanup, Spill response, Oil slicks, Equipment, *IHC Slicktrail

A consortium of Dutch dredging contractors have ordered the first IHC Slicktrail trailing dredge/oil recovery vessel. A few of the vessel's features include a hopper capacity of 5375 cubic meters, special pumps and oil/water separators in the after cofferdam, flameproof electrical equipment, extensive gas detection apparatus and special fire fighting equipment.

80A-0139

FRANK MOHN OIL SKIMMER PASSES TEST ON BRAVO BLOWOUT [news brief]

Anon. 1977.

Shipbuilding and Marine Engineering International 100(1211):425.

Spill cleanup, Skimmers, Performance testing, Product information,

*Bravo blowout

The Framo oil skimmer designed by Frank Mohn was developed to recover large quantities of oil from the sea surface at rates of up to 400 m³/hr. The Framo portable hydraulically-operated submerged pump is of the type used worldwide as an emergency offloading pump. The Framo system was the only successful skimmer in the Bravo blowout emergency in April 1977.

[from Oceanic Abstracts 15(4):#78-05149. 1978]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

80A-0140

MARINE POLLUTION CONTROL AND ENVIRONMENTAL MONITORING: IN BEACH CLEANUP,
LESS IS MORE (SOMETIMES)

Anon. 1979.

Sea Technology 20(5):30-40.

Spill cleanup, Beach cleanup, Equipment, Booms, Skimmers

Equipment and methods for cleaning up visible oil on beaches and the sea surface are discussed. Along with the successful operations, unsolved problems in spill containment are also reviewed.

[from Petroleum Abstracts 19(45):#269,605. _____]

80A-0141

MOPPING UP THE OIL [news brief]

Anon. 1978.

Marine Pollution Bulletin 9(10):255.

Spill cleanup, Spill recovery, Equipment, Performance testing, UK,
Sorbents, *Polypropylene mop

Britain's Warren Spring Laboratory in Stevenage is testing a "mop" made of polypropylene fibers which absorbs oil and rejects water. The mop is designed to be towed through oil spills and should operate in heavy waves. The mop can be wrung out, the oil recovered, and the mop returned to use.

80A-0142

NEW OIL CLEANUP PROCESS [news brief]

Anon. 1979.

Marine Pollution Bulletin 10(10):281.

Spill cleanup, Oil removal, Oil-water separation, product information

A new process of separating oil and water has been developed by the Total Group, together with Universal Matthey Products, Ltd. and Dunlop, which will aid in oil spill cleanup. The viscous emulsions are fluidized and the water and oil is separated by decantation. The new method will make early stages of cleanup operations easier since the water can be discharged immediately at the pollution site and only the oil needs to be transported.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

80A-0143

TECHNOLOGY--FOR CRUDE CLEANUPS [news brief]

Anon. 1980.

Science News, 117(22):349.

Spill cleanup, Sorbents, Sweden, Performance testing, *Bregoil

"Bregoil", a cellulose-derived product resembling swollen sawdust, is being tested in Sweden for oil spill cleanup. Previous tests have indicated that Bregoil is effective in absorbing crude oil but rejecting water, that it is cheaper than dispersants and far less toxic to fish and other biota.

80A-0144

UNIQUE CRAFT AFLOAT--BUT OWNERS HOPE NEVER TO USE IT [new brief]

Anon. 1979.

Mobil World 45(10):4.

Spill cleanup, Skimmers, Ships, Equipment, Oil-water separation

Upon arrival at the scene of a spill the Delbay skimmer vessel's jaw-like bow doors open and create a 17-ft.-wide funnel. As the vessel travels through the spill, floating oil is channeled inward, and a tilted conveyor belt forces oil into a collection tank. Oil and water separation takes place in the tank. The ship can empty its holding tanks into barges, enabling it to remain at the scene of a spill until cleanup is completed.

[from Petroleum Abstracts 20(16):#274,900. 1980]

80A-0145

US CLEANUP FUND [news brief]

Anon. 1979.

Marine Pollution Bulletin 10(8):218.

Legislation, Economics, US government, Spill cleanup, Oil industry

Proposed legislation sent by President Carter to Congress will provide a \$1.6 billion 'cleanup' fund for oil spills and hazardous industrial waste. If passed by Congress, 80% of the fund will come from industry. Legislation requires that the government be notified of spills and gives the authority for government to take over when cleanup measures are not adequate by industry.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

80A-0146

SPILLED-OIL ADSORBENT

Abe, K., S. Tomita, Y. Matsuda, K. Terajiina, and K. Ishikawa. 1979.
Japanese Patent Application 79 47,877.

Spill cleanup, Adsorption, Sorbents, Patent, *Fiber mats

An oil adsorbent is prepared from kapok fiber and fusible polyethylene, polypropylene or polystyrene fibers. The adsorbent has high strength and retains its shape during use and can be formed into sorbent mats.

[from Chemical Abstracts 91():#78,591s. 1979]

80A-0147

CRYOGENIC BEACH CLEANER

Acker, J.R., N.R. Braton, J.A. Koutsky, and R.F. Wendt. 1979.
US Patent 4,153,555

Beach cleanup, Sediments, Equipment, Patent, *Cryogenic method

A method and apparatus for cleaning oiled sandy beaches includes spreading pulverized rubber and wood fines on the contaminated area prior to a cryogenic treatment. A beach cleaning vehicle is outfitted with a liquid cryogen spray head and a hopper. The hopper is constructed to receive and discharge particulate absorbent before the contaminated area is contacted by the cryogen. The solidified mixture is then transported to a separation point where the oil and sand are separated.

[from Petroleum Abstracts 19(46):#269,824. 1979]

80A-0148

METHOD OF COLLECTING OIL FROM THE SURFACE OF WATER

Akiyama, T. 1979.
British Patent 1,543,836

Sorbents, Oil removal, Absorption, Patent, *Coir dust

A method of collecting oil from the surface of water is described wherein the oil is collected using an oil-absorbing material which consists of coir dust from husks of coconuts. The coir dust is impregnated with a substance which is hydrophobic and oleophilic.

[from Petroleum Abstracts 19(36):#267,367. 1979]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

80A-0149

COLD WEATHER TECHNIQUES

Allen, A.A. 1979.

Ecolibrium 8(3):10-15.

Spill cleanup, Cold climates, Equipment, Skimmers, Performance testing

Cold slows down movement of oil by increasing viscosity, but it also hinders cleanup efforts. Natural materials can be used to block spills (trees, snow, rocks, etc.). A performance test of the Mark 11-4E oil mops by means of an opening in the ice cover is detailed. This apparatus could remove oil under ice.

[from Environment Abstracts 9(10):#79-06109. 1979]

80A-0150

THE FEASIBILITY OF OIL SPILL DISPERSANT APPLICATION IN THE SOUTHERN BEAUFORT SEA

Allen, A.A., P.B. Hildebrand, and C.W. Ross. 1977.

Department of the Environment, Canada, Report EPS-3-EC-77-16. ____ p.

Dispersants, Spill removal, Beaufort Sea, Canada, Arctic

Summary not available.

[from Oil Spill Scenario for the Labrador Sea, Department of the Environment, Canada, Report EPS-3-EC-79-4, p. 487. 1979]

80A-0151

A QUANTITATIVE STUDY OF GELATION OF HYDROCARBON LIQUID SPILLS

Bahloul, S.K. 1978.

Masters Abstracts - US and Canada 17(1):39.

Oil spills, Spill cleanup, *Gelation

Various gelling agent solutions were tested for strength and reactions at various temperatures. At temperatures higher than 30°C gel strength fell sharply along a linear path, and at temperatures lower than 30°C gel strength rose steadily. Gelation is a promising technique of control and cleanup of oil spills in water.

[from Petroleum Abstracts 19(49):#270,519. 1979]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

80A-0152

COMBUSTION: AN OIL SPILL MITIGATION TOOL

Battelle Pacific Northwest Laboratory. 1979.

Report DOE/EV-1830-1, Contract EY-76-C-06-1830. 531 p. [variously paginated]

Spill cleanup, Spill disposal, Guidelines, Models, Bibliographies

The scope of this report is to evaluate the use of combustion for spill mitigation in the case of a stricken vessel, oil released upon water, and oil-contaminated debris disposal. Part 1 of the 2-part report is a practical guide for potential users; Part 2 is the research and resource document from which the practical guidelines are taken. Included is a detailed annotated bibliography, and a capsule review of a decade of oil combustion studies and other support information.

80A-0153

DISPERSING OIL SPILLS: A PRACTICAL GUIDE

BP Oil, Ltd. 1978.

London, BP Oil, Ltd., 1978. Report MP410/76. 12 p.

Spill cleanup, Spill response, Dispersants, Manuals, Guidelines

Summary not available.

[from Spill Technology Newsletter 4(2):87. 1979]

80A-0154

PERFORMANCE TESTING OF OIL MOP ZERO RELATIVE VELOCITY OIL SKIMMER

Breslin, M.K. 1978.

Report EPA-600/7-78-060, NTIS Report PB-280-232. 30 p.

Spill cleanup, Design-engineering, Performance testing, Adsorption, Equipment

The title study was conducted under EPA and USCG directives to determine the ability of the Oil Mop, Inc. zero relative velocity oil skimmer to recover oil from a water surface under different conditions. The device adsorbs oil onto oleophilic fibers woven into a rope; the rope is then squeezed by wringers to remove the oil into a recovery basin. Results of the tests are presented.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

80A-0155

CHEMICAL DISPERSION IN OIL SPILLS

Castle, R.W. 1979.

Ecolibrium 8(3):15-19.

Spill removal, Dispersants, Guidelines

Guidelines for decision-making about using chemical oil spill dispersants in a given oil spill emergency are given. Compatibilities of dispersant types with various oil types are assessed.

[from Environment Abstracts 9(10):#79-05940. 1979]

80A-0156

FEASIBILITY STUDY OF AERIAL APPLICATION OF OIL DISPERSANT CONCENTRATES FOR OIL SPILL CLEARANCE

Cormack, D. and J.A. Nichols. 1977.

Stevanage, Warren Spring Laboratory, 1977. 11 p.

Spill cleanup, Spill removal, Dispersants, Performance testing, *Aerial application, *Feasibility studies

Field and laboratory experiments indicate that oil can be chemically dispersed without the need for artificial agitation. Field trials to determine optimal droplet sizes for aerial distribution of dispersants on oil slicks were conducted, and experimental results are presented for various crude oils and different aircraft used. Logistics, costs, and the overall feasibility of aircraft application are discussed and compared with conventional dispersant operations.

[from Marine Pollution Research Titles 5(7):#1243. 1978]

80A-0157

ECOLOGICAL EFFECTS OF DISPERSANTS IN THE UNITED KINGDOM

Cowell, E.B. 1978.

Chemical Dispersants for the Control of Oil Spills. L.T. McCarthy, Jr., G.P.L. Lindblom, and H.F. Watter (eds.). Philadelphia, American Society for Testing and Materials, 1978. ASTM Special Technical Publication 659. p. 277-292.

Dispersants, Biological effects, Toxicity, Bioassay, Beach cleanup, Intertidal zone, Performance testing

Problems associated with dispersant use during the Torrey Canyon spill are described together with subsequent developments to reduce dispersant toxicity. Problems of laboratory bioassay and its limitations in ecological prediction are reviewed in relation to dispersant concentrations that are reached under field conditions.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

80A-0158

OIL SKIMMER MODULE WITH FREE FLOATING WEIR TROUGH

Crisafulli, A.J. 1979.

Canada Patent 1,049,936

Spill cleanup, Skimmers, Equipment, Design-engineering, Patent

An oil skimmer designed to remove floating pollutants and an adjacent thin layer of water, consists of a sump box with a partially submerged inlet, a pump, and a weir for separating the oil from the water.

[from Petroleum Abstracts 20(9):#273,416. 1980]

80A-0159

BASICS OF OIL SPILL CLEANUP

Department of the Environment, Canada. 1978.

Environment Canada, Report EN40-311-1978. — p.

Spill cleanup, Contingency planning, Spill response, Personnel training, Manuals, Guidelines

"This booklet is designed to provide the reader with a basic knowledge of the events which follow an oil spill. The emphasis has been placed on the cleanup of oil spills which occur on water since these spills spread most rapidly and cause the most apparent environmental damage. Complete with colour photographs and charts, this book presents in compact form the problems associated with oil spills and the various methods of cleanup."

[from Canadian Government Publishing Centre, Supply and Services Canada, Hull, Quebec K1A 0S9, Canada. Publishers announcement. 1978]

80A-0160

OIL SLICK REMOVAL AND RECOVERY SYSTEM

Ellis, R.D. 1978.

US Patent 4,120,751

Sorbents, Oil slicks, Spill removal, Equipment, Patent, *Foam strips

A method using a sorbent material, such as foam, is described which spreads the foam above and below an oil slick to sandwich the oil. The system includes a foam spreading apparatus, a harvesting vessel for cutting and shredding the foam, and a recovery vessel for separating the oil from the strips.

[from Petroleum Abstracts 19(38):#267,751. 1979]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL

2. Cleanup and Removal

80A-0161

A REVIEW OF OIL SLICK COMBUSTION PROMOTERS

Environmental Protection Service, Canada. 1979.

Department of the Environment, Canada. Report EPS-3-EC-79-8. 48 p.

Spill removal, Oil slicks, Performance testing, Product information

Four groups of combustion promoters are described in accordance with their effects upon the oil layer. Group A consists of oleophilic natural organic fibers (6 products); group B are processed minerals and chemicals which absorb oil and thermally insulate the oil layer (8 products); group C are processed minerals and chemicals treated to be hydrophobic and thermal insulators (9 products); and group D, materials which alter oil volatility while functioning as combustion promoters (1 product).

80A-0162

OIL SPILL CHEMICAL APPLICATION GUIDE

Exxon Chemical Co. 1978.

Houston, Texas, Exxon Chemical Co., 1978. 20 p.

Spill cleanup, Dispersants, Manuals, Guidelines, Spill response

Summary not available.

[from Spill Technology Newsletter 4(2):87. 1979]

80A-0163

COMPOSITION AND PROCESS FOR SELECTIVELY REMOVING OLEAGINOUS PRODUCTS FROM WATER

Funk, R.S., D.W. Mogg, and D.L. Ruff. 1979.

US Patent 4,142,969.

Spill removal, Absorption, Sorbents, Patent, *Perlite

An absorbent for oil spill removal is described which contains expanded volcanic glass (perlite), cellulose fibers, and hydrophobic asphalt sizing.

[from Chemical Abstracts 90():174,304a. 1979]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

80A-0164

USE OF THE TRECAN-PACE INCINERATOR DURING THE KURDISTAN SPILL

Gill, S.D. and G. Stevens. 1980.

Spill Technology Newsletter 5(1):9-14.

Equipment, Spill cleanup, Incineration, Performance testing, *Kurdistan spill

This article describes the on-site fabrication and use of a Trecan-Pace rotary kiln for the disposal of oiled debris and cleaning of oiled aggregate during the Kurdistan spill of March 1979. The spill occurred off Cape Breton Island, Nova Scotia, and in the cleanup operations, over 1000 barrels of oil and oiled beach material had been collected along with 4000 plastic bags of oiled debris. "In general . . . the incinerator, designed as an emergency unit that can be fabricated from readily available automobile parts and 45 gallon drums, proved to a cost effective oil pollution countermeasures technique."

80A-0165

A PRELIMINARY ASSESSMENT OF BEACH CLEANUP TECHNIQUES: A QUASI-LABORATORY ASSESSMENT

Haroy Associates. 1978.

Department of Fisheries and Environment, Environmental Protection Service, Environmental Emergency Branch, R & D Division, Canada. Draft report. ___ p.

Beach cleanup, Sorbents, Soil, Crude oil, *Residual oils, Burning, *Sinking

"This study evaluated the effectiveness of burning and sorbent techniques for cleaning off oil contaminated beaches in northern regions. The type of burn achieved, depth of penetration of oil, and amount of residue left were determined. Crude oils were used on fine gravel, sandy and mud flat beach soils. Twelve conclusions given relate to adequacy of burn being dependent upon an oil's ability to maintain a surface film as it penetrates the soil and reflooding to bring oil to surface was observed as not effective."

[from Combustion: An Oil Spill Mitigation Tool, Report DOE/EV-1830-1, p. B-14. 1979]

80A-0166

DEVELOPMENT OF A SPILLED OIL RECOVERY SEPARATOR FOR USE AS PART OF AN OIL SPILL REMOVAL DEVICE

Harvey, A., W. Mack, R. Stevenson, and A. Guzdar. 1977.

US Coast Guard, Office of Research and Development, Report USCG-D-88-77, Contract DOT-CG-53272-A. 104 p.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

Spill removal, Oil-water separation, Product information, Equipment

This report deals with the design, fabrication, testing, and control of title device. "A new design was needed to meet the different flow rate, separation performance, head and suction capability, oil type, and oil inlet concentration requirements."

[from Government Reports Announcements 78(9):177, #AD-A049 711/5GA. 1978]

80A-0167

DREDGER DOUBLES AS OIL RECOVERY VESSEL

Jansen, H.J. 1979.

Ocean Industry 14(6):83-84.

Spill removal, Design-engineering, Oil-water separation, Product information

IHC Holland has designed the IHC Slicktrail, a vessel which combines an oil recovery ship with a modern trailing suction hopper-dredger. The design provides for a hopper capacity of 5,375 cu m, cofferdams which surround the hopper and other features such as oil/water separators, extensive gas detection apparatus, special firefighting equipment, and a helicopter deck. The oil recovery installation comprises 2 sweeping arms which clear a 50 m wide path with each sweep.

[from Petroleum Abstracts 20(5):#272,568. 1980]

80A-0168

A SLICK WAY TO SCOOP UP OIL

Lampe, D. 1980.

Next 1(2):82-83.

Spill containment, Spill cleanup, Booms, Skimmers, Equipment, Design-engineering, Performance testing, UK

Briefly described is the "Oleanic Oil Skimmer", recently developed by the British Navy. The device is actually a segmented boom, each segment of which is designed to also skim off and capture floating oil. The boom is towed in a "V" configuration, thereby concentrating the oil slick as it reaches the skimming devices. The device is expected to operate effectively in harbor as well as open water conditions.

80A-0169

CONSTRUCTION OF AN AIR PORTABLE INCINERATOR FOR OIL SPILL DEBRIS

Lombard, W.K. 1979.

Spill Technology Newsletter 4(5):288-292.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

Spill disposal, Incineration, Solid wastes

The design and construction of a helicopter-transportable incinerator is described. The incinerator is designed for handling spill debris in remote or otherwise inaccessible areas.

80A-0170

OIL ADSORBENT FROM KAPOK FIBER AS AN OIL FENCE

Madera, A. 1979.

Japanese Patent Application 79 45,689

Oil-water separation, Wastewater treatment, Adsorption, Sorbents, Patent, *Kapok fibers

Kapok fibers formed into spheres, rods, sheets, or molded forms are heated to 80°C to remove wax and lignin, then rinsed with water and cooled to form an adsorbent for oil removal from water or wastewater.

[from Chemical Abstracts 91():#78,590r. 1979]

80A-0171

FRENCH OIL SPILL: CLEANUP PROVES TOUGH

Marshall and W. Kosman. 1978.

Chemical Engineering 85(11):112.

Spill cleanup, Spill response, Equipment, Dispersants, Contingency planning, Amoco Cadiz spill

"Use of presently available oil removal techniques during the spill of the Amoco Cadiz was largely unsuccessful due to sea conditions and equipment failures. Although several dispersant chemicals were used, natural wave action proved to be the most effective. Now research and development is necessary to meet the growing need for cleanup techniques."

80A-0172

USE OF MICROORGANISMS IN COMBINATION WITH SURFACE ACTIVE AGENTS TO SYNERGISTICALLY DISPERSE OIL SLICKS

Mohan, R.R., M.L. Robbins, A.I. Laskin, and L.A. Naslund. 1979.

US Patent 4,146,470.

Spill removal, Dispersants, Microorganisms, Biodegradation, Patent

A synergistic mixture of a sorbitanmonoleate dispersant and a dialkyl sulfosuccinate surfactant produces rapid dispersion of cohesive oil films or slicks, when specified microorganisms are used. The use of the synergistic mixture markedly reduces the quantity of chemical surfactants or detergents used for dispersion.

[from Petroleum Abstracts 19(46):#269,819. 1979]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

80A-0173

MECHANISM AND METHOD FOR RECOVERING MATERIAL FROM THE SURFACE OF A LIQUID BODY

Nebeker, E.B., S.E. Rodriguez, and P.G. Mikolaj. 1979.
US Patent 4,142,972

Spill recovery, Equipment, Oil slicks, Patent

An oil slick on water is collected by a mechanism consisting of an impeller and a rotatable tubular element which together form a free vortex at the surface of the liquid. The oil is drawn into a vortex pocket from which it can be pumped.

[from Petroleum Abstracts 20(10):#273,652. 1980]

80A-0174

DISPERSANT GELS FOR TREATING SURFACES CONTAMINATED WITH RESIDUAL OILS

Nichols, J.A. 1977.
Stevenage, UK, Warren Spring Laboratory, 1977.

Spill cleanup, Dispersants, *Residual oils

Summary not available.

[from Marine Pollution Research Titles 5(1):#68. 1978]

80A-0175

OCEAN OIL SKIMMER FOR CONTINUOUS REMOVAL OF OIL FROM THE OPEN SEA METHOD

Pogonowski, I.C. and J.R. Fowler. 1979.
US Patent 4,136,008

Spill cleanup, Skimmers, Gravity separation, Equipment, Patent

A system is described whereby a film of pollutant oil floating on water is continuously removed solely by gravity forces. A collecting tank of water is elevated above the oiled water with a large conduit extending from the tank into the oil. As the oil floats into the tank the water is displaced and sinks down through the tank to the water below. Only pollutants of lower densities than water rise into the collecting vessel tank.

[from Petroleum Abstracts 19(38):#267,749. 1979]

80A-0176

PROCEDURES OF FIGHTING AGAINST POLLUTION [in French]

Renault, P. and C. Rouit. 1979.
Petroleum Technology No. 263:36-44.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL

2. Cleanup and Removal

Toxicity, Surfactants, Dispersants, Spill removal, Tankers, Pollution control

The various generations of oil spill dispersants are reviewed, beginning with cleaning agents which were extremely toxic, up until present usage of nonionic surfactants. The organizational procedures of fighting pollution due to shipwrecked tankers is also described.

[from Petroleum Abstracts 20(2):#271,800. 1980]

80A-0177

APPARATUS FOR COLLECTING EFFLUENT OIL

Seike, Y., Y. Matsuo, M. Nakashima, T. Shojima, and S. Masaaki. 1979.
US Patent 4,136,654

Spill cleanup, Oil-water separation, Wastewaters, Skimmers, Equipment,
Patent

A weir-type skimming apparatus for collecting effluent oil is detailed. The apparatus includes a pair of left-and right-side inclined plates located in a forward-opened arrangement to form oil intake and collection ports.

[from Petroleum Abstracts 20(10):#273,654. 1980]

80A-0178

OHMSETT 'HIGH SEAS' PERFORMANCE TESTING: MARCO CLASS V OIL SKIMMER

Smith, G.F. and W.E. McCracken. 1978.
Leonardo, New Jersey, Mason and Hanger-Silas Mason Co., Inc., 1978.
Report PB-283 390/3SL. 49 p.

Spill cleanup, Skimmers, Performance testing, Product information,
Equipment

In the title tests, performance data was obtained for simulated offshore wave conditions and various skimming speeds. Skimmer efficiency was determined at various belt speeds and induction pump rates, and optimal skimmer settings and oil-water separation capabilities were assessed.

[from Spill Technology Newsletter 3(5):4. 1978]

80A-0179

A STRATEGY FOR SKIMMER DEVELOPMENT

Solsberg, L.B. 1979.
Spill Technology Newsletter 4(6):345-348.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

Spill cleanup, Skimmers, Design-engineering, Performance testing, Arctic, Cold climates, Canada, *AMOP

The Arctic Marine Oilspill Program (AMOP) is developing skimmers specifically designed for use in ice-laden waters and under other Arctic environmental conditions. Skimmers being considered are all fairly small, are deployable from ships or docks, can be remotely controlled, and have a discharge line which feeds the collected product to the mother ship via a positive-displacement type pump so that emulsification is minimized.

80A-0180

SPILL CONTROL ASSOCIATION OF AMERICA "BLUE BOOK"

Spill Control Association of America. 1978.

Southfield, Michigan, SCAA, n.d. — p.

Spill cleanup, Dispersants, Regulations, Personnel training, Spill cooperatives

"This 3-ring binder contains information on dispersants, pollution laws and regulations, SCAA member companies and cleanup training courses. Available for \$20.00 from the SCAA, 17117 W. Nine Mile Road, Suite 1515, Southfield, MI 48075."

[from Oil Spill Intelligence Report 2(19):4. 1979]

80A-0181

POLLUTING OIL RECOVERY APPARATUS

Strain, P.J. 1978.

US Patent 4,120,793

Spill containment, Spill removal, Equipment, Patent, Design-engineering

A system is described which recovers oil by surrounding the spill with booms attached to a recovery vessel that pumps the oil into the vessel. The oil is directed through a heated conduit which allows the oil to seek its natural level above the water. Baffles are provided to trap the oil; it is then drawn off to a storage and settling tank.

[from Petroleum Abstracts 19(38):#267,750. 1979]

80A-0182

CHARACTERISTICS OF THE MOBILE FIELD USE SYSTEM FOR THE DETOXIFICATION/ INCINERATION OF RESIDUALS FROM OIL AND HAZARDOUS MATERIAL SPILL CLEAN-UP OPERATIONS

Tenzer, R. 1978.

Environmental Protection Agency, Contract No. 68-03-2515. — p.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

Spill cleanup, Incineration, *Residual oils, Petrochemicals, Sludge,
Design-engineering, *Detoxification

The mobile detoxification/incineration system is designed to clean debris, soil, and water from oil, hazardous materials, viscous liquids, chemical and petrochemical sludges and pesticides. The system consists of a primary incinerator, an excess air afterburner, and gas stream processor (gas scrubber). Design details are included.

[from Combustion: An Oil Spill Mitigation Tool, Report DOE/EV-1830-1, p. B-31. 1979]

80A-0183

FIELD EVALUATION OF OIL MOP AND PREHEAT UNIT

Tindmarsh, G.B. and L.B. Solsberg. 1977.

Department of the Environment, Canada, Report EPS-4-EC-77-12. — p.

Spill cleanup, Skimmers, Equipment, Performance testing, Product information
Summary not available.

[from Oil Spill Scenario for the Labrador Sea, Department of the Environment, Canada, Report EPS-3-EC-79-4. p. 489. 1979]

80A-0184

AN EXPERIMENTAL EVALUATION OF SPILL BURNING PROMOTERS

Tom, G. and W.F. Purves. 1979.

Department of Fisheries and Environment, Canada. Draft Report available from R & D Division, Environmental Emergency Branch, EPS.

Performance testing, Burning, Spill removal, Arctic, Ice, *Combustion promoters

"A total of 395 combustion experiments were conducted in outdoor tanks during the winter of 1978. The program covered ten combustion promoters, three types of oil and two oil thicknesses. The ignition method was proved inadequate for Bunker C oil. Aged crude oils were burned both on water, in the presence of slush ice, in waves and under unconfined conditions. Test results continue to commend that in-situ burning is a promising method of disposing of Arctic oil spills."

[from Combustion: An Oil Spill Mitigation Tool, Report Doe/EV-1830-1, p. B-32. 1979]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
2. Cleanup and Removal

80A-0185

DEVELOPMENT OF A NEW WRINGER FOR THE ZERO-RELATIVE VELOCITY BELT SKIMMER

Ward, J.M. 1977.

US Coast Guard, Office of Research and Development, Report CG-D-3-78. 38 p.

Spill cleanup, Skimmers, Design-engineering, Equipment, Performance testing,

*Wringer

Summary not available.

[from Marine Pollution Research Titles 5(9):#1596. 1978]

80A-0186

PORTABLE BEACH INCINERATOR

Wayment, E.C. 1977.

Stevenage, UK, Warren Spring Laboratory, 1977. Report ISBN-0-85624-100-8.

7 p.

Spill disposal, Beach cleanup, Tar, Incineration, Equipment, Design-engineering

A portable incinerator was developed for onsite beach cleaning. Tar balls are put on a perforated plate resting over a drum and ignited from beneath. Molten residue drips into the drum and is subsequently burned. Combustion was more rapid in windy conditions.

[from Combustion: An Oil Spill Mitigation Tool, Report DOE/EV-1830-1, p. B-35. 1979]

80A-0187

THE LABORATORY EXAMINATION OF TWO PUMPS, A SEPARATOR AND A SKIMMER

Western Canada Hydraulic Laboratories, Ltd. 1979.

Spill Technology Newsletter 4(5):299-300.

Skimmers, Equipment, Performance testing, Oil-water separation, Spill recovery, *Pumps

Two commercial pumps were evaluated on the basis of weight, capacity, debris tolerance, self priming capability and ability to operate at temperatures down to -15°C, and results are summarized. An Oscar recovery vessel, which incorporates contra-rotating drums was tested to provide guidelines for optimal spill recovery. A dynamic test of an A.P.I. separator was conducted under simulated cold climate conditions and recommendations for design improvements were made.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
3. Environmental Restoration

80A-0188

RESTORATION OF OIL-CONTAMINATED SHORELINES

Castle, R.W. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.),
US Fish and Wildlife Service Report FWS/OBS/77-22, NTIS Report PB-282 375.
p. 105-112.

Shorelines, Contamination, Beaches, Sediments, Restoration

Recent experience with environmentally acceptable and cost-effective shoreline restoration techniques and common misapplications are reviewed, with emphasis on physical restoration methods. Included are the characteristics and restoration methods for sandy beaches, rocky shorelines, coastal wetlands, and mangrove swamp areas. With the possible exception of sandy beaches, "a definitive and effective state-of-the-art for restoration of oil-contaminated shorelines is nonexistent".

80A-0189

CURRENT METHODS OF OILED BIRD REHABILITATION

Williams, A.S. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.),
US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report PB-282 375.
p. 125-134.

Restoration, Birds, *Bird rehabilitation

An overview of current methods used at the International Bird Rescue Research Center is presented. The process of rehabilitation includes collection of the birds and onsite treatment, careful transport to, and treatment at the center, which involve medical treatment, cleaning, drying, feeding, rehydration, waterproofing, and preparation for release.

4. Personnel Training

80A-0190

CALIFORNIA HOSTS CLEAN UP PROGRAM [news brief]

Anon. 1978.

Offshore 38(13):111-112.

Personnel training, Performance testing, Equipment, Spill cleanup,
Dispersants, California, Oil industry, USCG

Under the supervision of the US Coast Guard, tests were conducted in waters off Catalina Island, California, to provide training and experience in the use of new techniques and equipment to clean up oil spills. Controlled discharges of crude oil were released in a 5 by 20 mile test zone and were totally cleaned up or dispersed before the end of each test day.

[from Petroleum Abstracts 20(16):#274,898. 1980]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
4. Personnel Training

80A-0191

WHAT CAN WE EXPECT FROM OIL PROTECTION? [in Norwegian]

Langfeldt, J.N. 1979.

Norsk Oljerevy 5(4):8-10.

Personnel training, Spill cleanup, Oil removal, Equipment, Contingency planning

Problems of oil spill removal are reviewed. . . "Collection at night can only take place to a limited extent, even with the help of lights and new technical equipment. The waves are a difficult problem, as when the wave height increases, oil will be whipped into the sea. . . There is little to be gained by developing equipment for high waves. The most efficient use of resources is development of equipment which is easier to use (also at night) and with larger capacity than today's equipment. Great emphasis must be placed on planning and training on all procedures in connection with oil collection."

[from Petroleum Abstracts 20(18):#275,447. 1980]

80A-0192

OIL SPILL TRAINING WORKSHOPS FOR CANADA'S COASTS

Zimlicki-Owens, L.M. 1979.

Spill Technology Newsletter 4(5):301-303.

Personnel training, Contingency planning, Spill response, Coasts, Behavior, Oil spills, Canada, *Workshops

A series of 3-day workshops for government and industry personnel is described. The primary objective is to provide on-scene commanders and other personnel involved in spill response operations with a basic understanding and working knowledge of the coastal processes, and of geologic and oceanographic factors that affect the distribution, impact and persistence of stranded oil.

5. Contingency Planning and Spill Response

80A-0193

BRITAIN EXPECTS . . . MORE OIL SPILLS [news brief]

Anon. 1978.

Marine Pollution Bulletin 9(12):316.

Contingency planning, Spill response, UK, Government agencies

Recent spill events in Britain led to an inquiry by the Commons Select Committee on Science and Technology into the adequacy of national contingency plans to cope with large spills. The committee's report is "scathingly critical" of the government's and public authorities' slowness in handling the May, 1978 Eleni V spill. Department of Trade inaction and lack of preparedness for spill response was also criticized.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
5. Contingency Planning and Spill Response

80A-0194

NEW YORK HARBOUR SPILL [news brief]

Anon. 1979.

Marine Pollution Bulletin 10(10):280.

Ships, Oil spills, Spill cleanup, New York, Bays, Harbors

A Liberian transport ship which ran aground in New York harbor was responsible for a 120,000 gallon oil spill. The majority of the oil was carried into the Verrazano Narrows, and approximately 50,000 gallons of the spill washed ashore on Staten Island. The cleanup operation was funded by the vessel's owner and special attention was paid to the area near the Jamaica Bay Wildlife Refuge.

80A-0195

PREPARING COUNTER-MEASURES AGAINST UNDER-ICE OIL SPILLS

Anon. 1977.

Offshore Engineer 12(1):34-35.

Contingency planning, Spill response, Blowouts, Arctic, Ice, Spill containment, Beaufort Sea

This article reviews possible blowout scenarios for the Beaufort Sea with special emphasis on oil spills under ice, and examines the spill response measures available for dealing with such situations. An underwater oil containment dome, the blasting of ice in a circle around a blowout, and the burning of surfacing oil are among spill countermeasures being considered.

80A-0196

NOVEL COUNTERMEASURES FOR AN ARCTIC OFFSHORE WELL BLOWOUT

Abdelnour, R., A.M. Nawwar, P. Hildebrand, and W.F. Purves. 1977.

Department of the Environment, Canada. Report EPS-3-EC-77-14. — p.

Contingency planning, Spill response, Blowouts, Offshore, Drilling, Arctic, Canada

Summary not available.

[from Oil Spill Scenario for the Labrador Sea, Department of the Environment, Canada, Report EPS-3-EC-79-4. p. 487. 1979]

80A-0197

A SHORELINE PROTECTION AND CLEANUP MANUAL FOR THE SOUTHERN BEAUFORT SEA

Arctic Petroleum Operators Association. 1979.

APOA Report No. 136. — p.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
5. Contingency Planning and Spill Response

Contingency planning, Spill cleanup, Manuals, Spill response, Arctic, Beaufort Sea, Shorelines

Summary not available. [Report is available from APOA Information Service, P.O. Box 1281, Station M, Calgary Alberta, T2P 2L2, at a cost of \$32.00.]

[from Spill Technology Newsletter 4(5):273. 1979]

80A-0198

INVESTIGATION OF EXTREME WEATHER OIL POLLUTION CAPABILITIES

Beach, R.L. et al. 1978.

Seaward International, Inc., prepared for Department of Transportation, US Coast Guard, Contract No. DOT-CG-80372-A. — p.

Pollution control, Spill cleanup, Skimmers, Dispersion, Tankers, *Oil stranding

"This report presents the state of the art in response to oil stranding and spills. Off-loading, cargo jettisoning, and tanker stabilizing were recommended in cargo stranding, and dispersing and skimming recommended for cleaning up spills."

[from Combustion: An Oil Spill Mitigation Tool, Report DOE/EV-1830-1, p. B-2. 1979]

80A-0199

DEPLOYMENT REQUIREMENTS FOR THE US COAST GUARD POLLUTION RESPONSE EQUIPMENT. VOLUME I. ANALYSIS

Bellantoni, J., J. Garlitz, R. Kodis, A. O'Brien, Jr., and A. Passera. 1979.

Final Report USCG-D-14-79, AD-A070-815/OSL. 471 p.

Contingency planning, Spill response, Equipment, USCG, Information systems, Statistical analysis, Simulations, *Logistics

Presented are the results of a study that examined the logistical and equipment requirements that would have to be met so that the US Coast Guard could provide an adequate response within 6 hours for oil spills up to 100,000 tons in US waters. The study incorporates statistical analyses of recent US and worldwide oil spills, and these findings are converted to specific spill response equipment requirements for the USCG and other spill response organizations. Based on worldwide spill experience, 3 massive spill scenarios are presented for US coastal waters, and spill response capabilities are evaluated.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL

5. Contingency Planning and Spill Response

80A-0200

DEPLOYMENT REQUIREMENTS FOR US COAST GUARD POLLUTION RESPONSE EQUIPMENT.
VOLUME II. APPENDICES

Bellantoni, J., J. Garlitz, R. Kodis, and A. O'Brien. 1979.

Final Report USCG-D-14-79-2, AD-A070-816/4SL. 85 p.

Spill response, Equipment, USCG, Statistical analysis, Information systems, Tankers, Oil slicks, Behavior

This is the second of two volumes. Volume I contains the major analysis and conclusions; Volume II contains 13 technical appendices. Among these are data on an oil spill information system, narratives of 17 selected oil spills 1967-1978, an analysis of the potentials of large and simultaneous spills, a list of non USCG pollution response capabilities, and a review of the behavior of surface oil slicks.

80A-0201

PROBABILITY OF OIL SPILL BLOWOUTS IN CANADIAN ARCTIC WATERS

Bercha, F.G. and Associates. 1978.

Fisheries and Environment Canada, Report EPS-3-EC-78-12. 150 p.

Contingency planning, Predictions, Blowouts, Arctic, Offshore, Canada

Summary not available.

[from Oil Spill Scenario for the Labrador Sea, Department of the Environment, Canada, Report EPS-3-EC-79-4. p. 324. 1979]

80A-0202

A CLIMATOLOGICAL OIL SPILL PLANNING GUIDE. NO. 1-THE NEW YORK BIGHT

Bishop, J.M. 1980.

National Oceanic and Atmospheric Administration, Environmental Data and Information Service, 1980. 126 p.

Guidelines, Contingency planning, Spill response, New York, New Jersey

"This report summarizes appropriate environmental data, discusses the movement of oil at sea, and attempts to predict the effects of oil spills for the New York Bight, a region lying between Montauk Point, N.Y., and Cape May, N.J." The information is provided in a format that can be understood and used by decisionmakers in contingency planning and spill response.

80A-0203

THE OIL FROM THE ELENi V [editorial]

Bourne, W.R.P. 1978.

Marine Pollution Bulletin 9(10):253.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
5. Contingency Planning and Spill Response

Spill response, Government agencies, Fisheries, Birds, UK, *Eleni V spill

The ineptitude and inaction of British authorities in handling the Eleni V fuel oil spill of 6 May 1978 is criticized. Although local fisheries near the spill site were apparently badly affected, and hundreds of birds were killed, "the main damage appears to have been the enormous cost of bungled management of the wreck, and it seems time someone was called to account for it".

80A-0204

CHEMICAL OIL DISPERSING AGENTS AND THEIR FEASIBILITY FOR USE

Canevari, G.P. 1977.

Proceedings of the 1977 Oil Spill Response Workshop, P.L. Fore (ed.).

US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report PB-282 375. p. 83-94.

Spill response, Dispersants, Pollution control

The development and current status of dispersant usage is reviewed, and the benefits are emphasized. Benefits of dispersant usage are said to include (1) increased rates of oil biodegradation, (2) decreased damage to waterfowl, (3) reduced firehazards of spilled oils, (4) dispersion into the water column before the oil can reach beaches and coasts, and (5) prevention of the formation of tarry oil residues.

80A-0205

OIL SPILL COUNTERMEASURES FOR THE LABRADOR OFFSHORE

C-CORE (Centre for Cold Ocean Resources Engineering). 1979.

Oil Spill Scenarios for the Labrador Sea. B.R. LeDrew and K.A. Gustajtis. Department of the Environment, Canada, Report EPS-3-EC-79-4. Chapter 14. p. 435-489.

Contingency planning, Predictions, Spill response, Government agencies, Oil industry, Equipment, Offshore, Exploration, Canada, Labrador Sea

Presented is an overview of the plans and equipment which are available in Canada and which would be deployed to deal with a major oil spill from offshore exploratory drilling. Contingency plans are described, relevant action sequences are outlined, and logistics requirements are identified. Response measures identified in government agency and operator's contingency plans are assessed for their feasibility in terms of a likely oil spill scenario.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
5. Contingency Planning and Spill Response

80A-0206

NEEDS OF THE FEDERAL ON SCENE COORDINATOR AND REGIONAL RESPONSE TEAM FOR WILDLIFE EXPERTISE

Corbett, C.R. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.).
US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report
PB-282 375. p. 29-32.

Spill response, Wildlife, Government agencies, Contingency planning,
*USFWS

The Federal On-Scene Coordinator (OSC) needs the services of a US Fish and Wildlife Service field representative, in order to assist the OSC and his response team in carrying out local response efforts. A regional representative, in close contact with the field representative should also be available to participate in the decision making efforts of the OSC and the spill response team.

80A-0207

THE FIGHT AGAINST ACCIDENTAL MARINE POLLUTION BY HYDROCARBONS. THE AMOCO CADIZ EXPERIENCE, MARCH-SEPTEMBER 1978 [in French]

Direction des Ports et de la Navigation Maritimes. 1979.

France, Direction des Ports et de la Navigation Maritimes, 1979. 193 p.

Spill response, Hydrocarbons, Crude oil, Amoco Cadiz spill, France,
Pollution control

Summary not available.

[from Marine Pollution Research Titles 6(10):#1818. 1979]

80A-0208

CONTAINMENT AND RECOVERY TECHNIQUES FOR SPILLED OIL IN THE MARINE ENVIRONMENT

Donohue, M.J. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.).
US Fish and Wildlife Service, Report FWS/OBS/77-22 NTIS Report
PB-282 375. p. 69-82.

Spill containment, Spill cleanup, Equipment, Booms, Skimmers, *Deployment methods

Currently available oil containment and cleanup equipment and deployment techniques are reviewed. Included is a review of design characteristics useful in assessing the efficiency of booms and skimmers in local situations.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
5. Contingency Planning and Spill Response

80A-0209

FEDERAL VIEWPOINT ON USE AND POTENTIAL OF CHEMICAL OIL DISPERSANTS

Dorrler, J.S. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.).

US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report
PB-282 375. p. 95-104.

Spill response, Government agencies, Regulations, Dispersants, *Application procedures

The types and general compositions of dispersants are summarized and their usage and application procedures are reviewed in light of federal policies established by the National Oil and Hazardous Substances Pollution Contingency Plan of 1975.

80A-0210

AN ARCTIC ATLAS: BACKGROUND INFORMATION FOR DEVELOPING MARINE OILSPILL COUNTERMEASURES

Fenco Consultants, Ltd., Calgary, and F.F. Slaney and Co., Ltd., Calgary. 1978.

Ottawa Canada, Environmental Protection Service, Environmental Emergency Branch, Research and Development Division, 1978. 481 p.

Contingency planning, Arctic, Marine environment, Canada, Baseline studies, Labrador Sea, *Information atlas

The purpose of this compendium is to present a multidisciplinary overview of information relevant to marine oil spills in the Canadian Arctic and in the Labrador Sea. Subjects covered are geology and petroleum development, meteorology and oceanography, ice, biology, and social aspects.

[from Arctic 32(1):88-90. 1979]

80A-0211

OILSPILL PREPAREDNESS ON THE CANADIAN PRAIRIES BY THE EXPLORATION AND PRODUCTION SECTOR OF THE PETROLEUM INDUSTRY

Ford, B.A. 1979.

Spill Technology Newsletter 4(6):336-344.

Contingency planning, Spill response, Oil industry, Inland, Equipment, Canada, *Prairies

This article describes the Prairie Regional Oil Spill Containment and Recovery Advisory Committee (PROSCARAC), together with some detailed information regarding specialized countermeasures equipment trailer units located strategically throughout the region.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
5. Contingency Planning and Spill Response

80A-0212

PROCEEDINGS OF THE 1977 OIL SPILL RESPONSE WORKSHOP

Fore, P.L. (ed.). 1977.

US Fish and Wildlife Service, Biological Services Program, Report
FWS/OBS/77-24, NTIS Report PB-282 375. 153 p.

Spill response, Biological effects, Wildlife, Contingency planning,
Government agencies, Personnel training, *USFWS, *Workshop

The 1977 Oil Spill Response Workshop [Metairie (New Orleans), Louisiana, 15-17 February, 1977] was held to discuss US Fish and Wildlife Service responsibilities, capabilities, and procedures in response to spills, to disseminate information on biological effects of spills on wildlife and effective response measures, and to critique and finalize a USFWS spill contingency plan. [The 18 presented papers are abstracted separately in this issue of OPA. See Albers, Castle, Canevari, Corbett, Donohue, Dorrlar, Eastin, Fletcher, Hay, Hess, Lee, Mattson, Nadeau, Nelson, Putnam, Stanton, Ward, and Williams.]

80A-0213

COUNTERMEASURES FOR OIL SPILLS

Fraser, J.P. 1979.

Ecolibrium 8(3):7-10.

Spill response, Spill cleanup, Equipment, Contingency planning

A technique is presented for matching the most efficient oil spill control equipment with a specific oil spill problem. Considerations involved are: the likelihood of an oil spill occurring, spill size, and environmental impacts.

[from Environment Abstracts 9(10):#79-05939. 1979]

80A-0214

PROCEDURES OF FIGHTING AGAINST POLLUTION: VARIOUS INTERVENTIONS WITH SHIPS IN TROUBLE, LIGHTERING [in French]

Gouze, J. and J. Binot. 1979.

Petroleum Technology No. 263:33-36.

Contingency planning, Amoco Cadiz spill, Tankers, Oil tanks, Storage, Oil transfer, Oil removal

In the wake of the Amoco Cadiz disaster, new studies on methods of lightering were undertaken. The solution discussed is a buffer capacity vessel which would remove the oil from the shipwrecked tanker and pump it to a storage tank in another vessel anchored in safe waters.

[from Petroleum Abstracts 20(2):#271,799. 1980]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
5. Contingency Planning and Spill Response

80A-0215

PARLIAMENTARY COMMISSION OF INQUIRY REPORTS ON AMOCO CADIZ DISASTER

Henry, C. 1978.

Environmental Policy and Law 4(4):176-177.

Amoco Cadiz spill, Spill response, Contingency planning, France,

*Commission report

Briefly reviewed are the findings and recommendations of a French parliamentary commission of inquiry responsible for "examining the decisions taken and the methods employed by the competent French, foreign, and international authorities at the time of the recent wreck of an oil tanker on the coast of Brittany".

80A-0216

NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN AND
FEDERAL RESPONSIBILITIES

Hess, R.E. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.).
US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report
PB-282 375. p. 23-28.

Contingency planning, Government agencies, Legislation, USCG, EPA,
*FWPCA

Reviewed are the major provisions of the title Plan, which fulfills a requirement of the 1972 Amendments to the Federal Water Pollution Control Act. The responsibilities of the US Coast Guard, and the Environmental Protection Agency, in implementing these provisions are briefly outlined, and the roles of other federal departments and agencies, including the Department of Interior, Department of Commerce and Department of Defense, are identified.

80A-0217

PROBABILITY OF AN OIL BLOWOUT AND THE CONCEPT OF RISK

Kierans, T. and B. LeDrew. 1979.

Oil Spill Scenario for the Labrador Sea. B.R. LeDrew and K.A. Gustajtis.
Department of the Environment, Canada, Report EPS-3-EC-79-4. Chapter 9.
p. 301-345.

Contingency planning, Blowouts, Risk analysis, Labrador Sea

This paper assesses the probability of a blowout, the factors influencing the probability of a blowout---geological, climatic and environmental, human error, equipment and engineering failures---and the relative risks of a blowout in the Labrador Sea.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
5. Contingency Planning and Spill Response

80A-0218

CONTINGENCY PLANS FOR FIGHTING AGAINST THE POLLUTION OF THE SEA BY HYDRO-CARBONS

LeLourd, P. 1979.

Technique de l'Eau, No. 390/391:39-52.

Contingency planning, Spill response, France

Summary not available.

[from Marine Pollution Research Titles 7(2):#331. 1980]

80A-0219

WORKSHOP ON OIL---GAS AND ICE

Mackay D. 1980.

Spill Technology Newsletter 5(1):15-18.

Arctic, Ice, Spill response, Spill cleanup, Beaufort Sea, Atlantic coast, Canada, *Workshop opinion survey

At the title workshop, the 35 participants were asked to quantify the capability of oil spill response now and in the future, in regard to Canadian Arctic waters. The summarized opinions on present and future countermeasures capabilities are tabulated and discussed for the Beaufort Sea, the Canadian east coast, and all Canadian northern waters.

80A-0220

ACOUSTIC POSITIONING USED SUCCESSFULLY IN IXTOC I BLOWOUT RESPONSE

Mulcahy, M. 1980.

Sea Technology 21(2):18-19.

Blowouts, Ixtoc I blowout, Platforms, Spill response

Acoustic Positioning of the platform, which was connected to the Sombrero, a structure devised to restrict oil outflow, was initiated to restrict the spillage from the Ixtoc I well blowout.

80A-0221

A PHILOSOPHICAL APPROACH TO FISH AND WILDLIFE SERVICE INVOLVEMENT IN OIL SPILL RESPONSE

Nelson, H.K. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.).

US Fish and Wildlife Service, Report FWS/OBS/77-24, NTIS Report PB-282 375. p. 1-10.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
5. Contingency Planning and Spill Response

Spill response, Contingency planning, Personnel training, Government agencies, *USFWS

USFWS involvement and responsibilities for effective and timely oil spill response are outlined. The author stresses pre spill planning and preparedness in that the key to successful spill response is predesignation of responsibilities. Spill response measures and post spill evaluation and reporting needs are also addressed.

80A-0222

CALIFORNIA'S RESPONSE TO POLLUTION INCIDENTS

Putnam, W.H. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.). US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report PB-282 375. p. 33-36.

Spill response, Pollution control, Government agencies, Contingency planning, Birds, California

A brief overview of the California Oil Spill Contingency Plan, which reconciles differences between federal contingency planning and local response measures is presented. California Department of Fish and Game efforts in the field of oiled bird treatment and rehabilitation are reviewed.

80A-0223

OIL-SPILLS IN THE MEDITERRANEAN AND CONTINGENCY PLANNING

Ress, P.E. 1979.

Environmental Conservation 6(3):230.

International conventions, Oil spills, Dispersants, Contingency planning, IMCO, *Malta Centre

A workshop was held at the Regional Oil-Combating Centre in Malta, which was attended by oil spill experts from 14 Mediterranean countries and the European Economic Community. Discussed were the subjects of chemical dispersants and the Centre's role as communications coordinator in the event of a major spill.

80A-0224

LOGISTICS CAPABILITY: LABRADOR

Shawmont Newfoundland, Ltd. 1979.

Oil Spill Scenarios for the Labrador Sea. B.R. LeDrew and K.A. Gustajtis, Department of the Environment, Canada, Report EPS-3-EC-79-4, Chapter 12. p. 369-404.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
5. Contingency Planning and Spill Response

Spill response, Labrador Sea, Canada, Coasts, *Logistics, *Support services
Described are the existing and planned logistics capability and support services of the Labrador Sea area with reference to the supporting needs of oil spill countermeasures activities. These include communications systems, radio networks, navigational aids systems, and coastal airport and seaport facilities.

80A-0225

SPILL RISK ANALYSIS PROGRAM: METHODOLOGY, DEVELOPMENT AND DEMONSTRATION OF POLLUTION INCIDENT REPORTING SYSTEM. VOLUME II

White, W.D. and L.A. Stoehr. 1977

US Coast Guard, Office of Research and Development, Report CG-D-22-77. Final report. 106 p.

Oil spills, Risk analysis, Information systems, Statistics, USCG, *PIRS
Summary not available.

[from Marine Pollution Research Titles 5(9):#1559. 1978]

6. Legal and Regulatory Aspects

80A-0226

INTERNATIONAL OIL POLLUTION COMPENSATION FUND [news brief]

Anon. 1979.

Marine Pollution Bulletin 10(11):314.

Compensation, Oil spills, Liability, IMCO, *International Oil Pollution Compensation Fund

The International Oil Pollution Compensation Fund, "established under the 1971 IMCO Convention, has increased compensation to victims of oil pollution beyond the level of the shipowner's liability. Contributions to the Fund come from oil companies and other persons who have received more than 150,000 tons of crude or heavy fuel oil by sea in the relevant year. To receive compensation you must be a member of the Fund Convention, presently 18 members".

80A-0227

OVERVIEW OF OIL SPILL CLEANUP

Evans, J.A. 1979.

Ecolibrium 3(2):3.

Spill cleanup, Regulations, Liability

The determination of legal responsibility for cleaning up oil spills is examined. Owner and lessee responsibility for oil spills is also discussed.

[from Environment Abstracts 9(10):#79-05938. 1979]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
6. Legal and Regulatory Aspects

80A-0228

AFTERMATH OF THE AMOCO CADIZ---WHY MUST THE EUROPEAN COMMUNITY ACT?

Nagelmackers, H.G. 1980.

Marine Policy 4(1):3-18.

Europe, International agreements, Amoco Cadiz spill, Contingency planning, Regulations

This article examines the policy and action of the European Community in dealing with marine oil pollution in the wake of accidents, also the legal provisions for such action and international laws. Other subjects discussed are the relationships between intergovernmental provisions, a history of the Community action following Amoco Cadiz and recommendations for future action by the Community.

7. General Prevention and Control Measures

80A-0229

CAN BRITAIN COPE WITH OIL SPILLS [news brief]

Anon. 1980.

New Scientist 85(1198):814.

Pollution prevention, Spill containment, Spill cleanup, Government agencies, Dispersants, UK

The government's actions concerning a capsized oil tanker off the Isle of Wight were questioned. The Department of Trade's Marine Pollution Control Unit (MPCU) used an ineffective method to contain the oil and was criticized; however, spraying of the oil would have posed a threat to wildlife. Britain looks for a means of minimizing amounts of oil reaching the shore through booms and skimmers.

80A-0230

MARINE POLLUTION CONTROL AND ENVIRONMENTAL MONITORING [news brief]

Anon. 1979.

Sea Technology 20(8):39.

Spill response, Blowouts, Monitoring

Petroleos Mexicanos is relying on two relief wells to control the blowout of the Ixtoc I oil well 50 miles off the shore of Campeche, Mexico. Oil flow estimates from the June blowout range from 8,000 to 30,000 bpd. Efforts to control the blowout and the spilled oil are described.

[from Petroleum Abstracts 20(4):#272, 266. 1980]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
7. General Prevention and Control Measures

80A-0231

MARINE POLLUTION FEATURE

Anon. 1977.

M/E/R Marine Engineers Review, June 1977:10-39.

Pollution control, Regulations, Equipment, Product information, International agreements, Blowouts, Oil-water separation

"Marine pollution regulations and pollution control devices are discussed. Topics discussed include . . . oily water separators manufactured by Victor Oil Water Separators and Alexander Esplen; IMCO's 1969 amendments to the 1954 International Convention for the Prevention of Pollution of the Sea by Oil, which were to become effective in January 1978; an oil skimmer developed by Thune-Eureka A/S designed for hazardous North Sea conditions; reconditioning industrial oil; a homogenizer developed by Vickers Limited to treat shipboard fuel; a pollution control consulting service offered by Electrolux-Wascator; and potentials for blowouts and their consequences in drilling offshore Norway N of 62° latitude."

[from Oceanic Abstracts 15(4):#78-05517. 1978]

80A-0232

YEAR-END REVIEW: APRIL 1978-MARCH 1979---RESEARCH & DEVELOPMENT DIVISION
ENVIRONMENTAL EMERGENCY BRANCH

Anon. 1979.

Spill Technology Newsletter 4(3):58.

Spill cleanup, Pollution prevention, Pollution control, Equipment, Blowout prevention, Bibliographies

Research topics reviewed include: fate of oil on open water, dispersant effects and applications, deep-water blowouts, boom evaluation and development, skimmer development and testing and other oil spill related material. A list of oil spill technology literature publications by EPS is included.

[from Environment Abstracts 9(10):#79-05933. 1979]

80A-0233

PROTECTION OF GROUNDWATER FROM OIL POLLUTION

De Pastrovich, T.L. et al. 1979.

CONCAWE Report 3/79. 64 p.

Oil spills, Contamination, Groundwater, Pollution prevention, Disposal, Oil removal, Recovery, Restoration

The data necessary to predict the migration and consequences of an oil spill in permeable strata and groundwater are described. Preventive measures for protecting groundwater from nearby oil spills are listed and discussed. Other topics covered include: limitation of an oil spread, recovery of oil and oily water after an oil spill, disposal of recovered oil and oily water, and restoration of the environment after an oil spill.

[from Environment Abstracts 9(8):#79-04768. 1979]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
7. General Prevention and Control Measures

80A-0234

TESTING OF AIR DEPLOYABLE INCENDIARY DEVICES FOR IGNITING OIL ON WATER
Energetex Engineering. 1978.

Department of the Environment, Canada, Report EPS-EC-78-11. p. 4-8.

Spill removal, Burning, Performance testing, Equipment, Cold climates,
Canada, *Incendiary devices

Field experiments were conducted in which several incendiary devices were compared for their ability to ignite crude oil slicks under static and environmental conditions. Static tests suggest that fresh crude oil slicks over 1 mm thick are readily ignited; ignition of weathered oil over 3 mm thick is possible but difficult.

[from Canada Environmental Protection Service, Report EPS 4-EC-78-11:48. 1979]

80A-0235

STATUS AND FUTURE TRENDS IN OIL SPILLS AND IMPLICATIONS FOR THE US FISH AND WILDLIFE SERVICE

Fletcher, A.E. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.).
US Fish and Wildlife Service, Report FWS/OBS/77-24, NTIS Report
PB-282 375. p. 11-22.

Statistics, Sources, Spill response, Tankers, Offshore, Contingency
planning, *USFWS

The author reviews recent spill statistics and argues that, largely because of dramatic increases in the rates of oil importation, it is tankers, barges and other vessels, rather than offshore production facilities, which have been the greatest source of recent oil spills. Roughly 85-90% of the oil is spilled in accidents of over 10,000 bbl each; therefore, the US Fish and Wildlife Service should tailor its response capabilities to large spills.

80A-0236

THE UN SYSTEM IN THE FIGHT AGAINST MARINE POLLUTION

Griffiths, R.C. 1977.

Fishing News International 12(16):41-46.

Pollution prevention, Pollution control, UN, Marine environment

Summary not available. [possibly oil pollution related]

[from Marine Pollution Research Titles 5(2):#190. 1978]

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
7. General Prevention and Control Measures

80A-0237

THE BALTIC SEA ENVIRONMENT PROTECTION COMMITTEE

Grzywaczewski, Z. 1979.

Spill Technology Newsletter 4(6):329-335.

Pollution control, *Environmental protection, Baltic Sea, International conventions

The goals of the International Convention on the Protection of the Marine Environment of the Baltic Sea Area, which will enter into force in 1980 are summarized, and recent efforts of the various work groups, delegations, and committees are outlined. The Convention addresses oil pollution from tankers, ships, offshore development and onshore industries, as well as other pollutants.

80A-0238

WASHER SCRUBS BUNKER OIL FROM ENCRUSTED GEAR

Hammond, J. 1979.

National Fisherman 60(8):51.

Spill cleanup, Fisheries, Equipment, *Fishing gear cleanup

When oil spills occur along the coast, "fishing nets and lobster pots, along with floats and miscellaneous gear, are heavily coated with bunker oil, rendering them useless for long periods of time, if not permanently, while the time-consuming business of filing claims against the offending vessels gets underway". The Canadian Coast Guard has developed equipment that can quickly clean oil-encrusted fishing gear.

80A-0239

INDUSTRY VIEWS AND RESPONSIBILITIES IN OIL SPILL/WILDLIFE OPERATIONS

Hay, K.G. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.).

US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report

PB-282 375. p. 37-42.

Spill response, Pollution control, Oil discharges, Tankers, Ballast, Birds, Spill cooperatives, Oil industry

Oil and tanker industry efforts to control oil spills and operational oil discharges are summarized. These measures include segregated ballast tanks, crude oil washing, improved navigation systems, onshore ballast treatment facilities, oil spill cooperatives, superfund legislation, and bird cleanup and rehabilitation techniques.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
7. General Prevention and Control Measures

80A-0240

THE MEDITERRANEAN PROGRAMME: REGIONAL OIL-COMBATING CENTRE FOR THE MEDITERRANEAN-MED XII. PROGRESS REPORT ON FIRST YEAR OF ACTIVITY OF THE CENTRE

Le Lourd, P. 1977.

Geneva, United Nations Environmental Programme, 1977. Report UNEP/IG. II/INF. 7, GE 77-12248. 43 p.

UN, Spill response, Mediterranean Sea, Pollution control

Summary not available.

[from Marine Pollution Research Titles 5(9):#1575. 1978]

80A-0241

NEW USES OF EXISTING TECHNOLOGY FOR CONTROLLING BLOWOUTS: CHRONOLOGY OF A BLOWOUT---OFFSHORE LOUISIANA

Lewis, J.B. 1978.

Journal of Petroleum Technology 30(10):1473-1480.

Blowouts, Pollution control, Offshore, Production, Platforms, Louisiana

Described are new uses for existing blowout control technology, as applied in an actual blowout of a gas well in the West Cameron 165 Field of offshore Louisiana. The blowout occurred on 24 March 1976 and a quickly dispatched blowout control team had a relief well drilled and blowout under control by 3 May. This article focuses on novel methods used for determining if the blowout was occurring underground or at the seabed, and new techniques developed to monitor blowout control operations.

80A-0242

EVALUATION OF SPILL CLEAN-UP EQUIPMENT, OHMSETT

Lichte, H.W. 1980.

Spill Technology Newsletter 5(1):19-21.

Performance testing, Equipment, Spill cleanup, Design-engineering, EPA, *OHMSETT test facility

Described are the current capabilities of the US Environmental Protection Agency's Oil and Hazardous Materials Simulated Environmental test tank (OHMSETT) which has been used to evaluate and further develop spill cleanup methods without endangering the environment since 1974. Future research programs at OHMSETT will emphasize Arctic designs, better fluids management/pumps, vessel of opportunity deployment, new methodology, and better understanding of mechanical spill cleanup devices.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
7. General Prevention and Control Measures

80A-0243

POLLUTION ABATEMENT OF A COMPLEX MIXTURE OF PHOTOGRAPHIC, PLATING AND OILY WASTES

McGuire, M.J., G.T. Fraser, and N. Schmokel. 1979.
Industrial Waste Conference, 33rd, Purdue University, Lafayette, Indiana,
9-11 May 1978. Ann Arbor, Michigan, Ann Arbor Science Publishers, Inc.,
1979. p. 10-21.

Pollution control, Regulations, Wastewaters, Oil discharges, Industries,
California

An industrial waste study was undertaken at the Naval Air Station/Pacific Missile Test Center, Point Mugu, California, to determine the best course of action to be taken to assure continued compliance with applicable pollution control regulations. "The purpose of this paper is to present a case history of a project that proposed solutions to an industrial waste problem in the face of a changing regulatory picture."

80A-0244

THE FIGHT AGAINST MARINE POLLUTION BY HYDROCARBONS [in French]

Rerolle, E., J. Bailhache, F. Michon, C. Lapeyre, et al. 1979.
Petroleum Technology No. 260:19-29.

Oil industry, Regulations, International conventions, US, Legislation,
Pollution control, *Navigation aids

This article focuses on the measures taken to decrease oil pollution. Included is a discussion of oil industry efforts, the 1969 amendments to the Convention of 1954, and US regulations. More recent efforts have been directed toward better means of navigation, improvements in control and steering apparatus and better radar systems.

[from Petroleum Abstracts 20(2):#271,801. 1980]

80A-0245

POLLUTION THREATENS RED SEA

Sadar, Z. 1980.
New Scientist 85(1197):719.

Pollution control, Ecosystems, Marine organisms, Red Sea, Monitoring,
Oil industry, Wastewaters, International agreements, *ALESCO

The Arab League Educational, Cultural and Scientific Organisation (ALESCO) reported that urgent steps must be taken to control oil pollution, which is increasing, in order to preserve marine organisms and ecosystems in the Red Sea. The surrounding Middle Eastern countries were persuaded to agree to monitor pollution in 1974, especially Saudi Arabia, with its oil industry activities. ALESCO will establish several marine research stations around the Red Sea coast to monitor waste. The only factor hindering the agreement is politics.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
7. General Prevention and Control Measures

80A-0246

IMCO---ITS BACKGROUND AND CURRENT ROLE

Srivastava, C.P. 1977.

Marine Engineers Review, November 1977:9-12.

Pollution prevention, International conventions, IMCO

International Maritime Consultative Organization (IMCO) provides assistance to developing nations in pollution prevention. IMCO expects to consider conventions involving marine pollution and other related topics in the future.

[from Oceanic Abstracts 15(4):#78-05429. 1978]

80A-0247

OPERATIONAL PROCEDURES FOR REDUCING WILDLIFE LOSSES: OVERVIEW AND FUTURE CONSIDERATIONS

Stanton, P.B. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.).

US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report

PB-282 375. p. 135-138.

Pollution prevention, Birds, Wildlife, Restoration, Habitats

Because bird rehabilitation after oil spills has such a limited success rate, other approaches to bird preservation must be developed. "Emphasis must be focused on habitat preservation and management, increases in the reproductive potential of affected species, and development of new tanker traffic routes."

80A-0248

ASSESSMENT OF TREATED VS. UNTREATED OIL SPILLS. (INTERIM REPORT)

University of Rhode Island. 1978.

University of Rhode Island, Report No. HCP/W4047-02. 410 p.

Spill response, Spill cleanup, Dispersants

Summary not available.

[from Marine Pollution Research Titles 6(7):#1257. 1979]

80A-0249

CONTROL OF MARINE POLLUTION: AN ESSAY REVIEW

Waldichuk, M. 1977.

Ocean Development and International Law Journal 4(3):269-296.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
7. General Prevention and Control Measures

Pollution control, Marine environment, Legislation, Economics, International agreements, *Review

This essay discusses underlying principles in marine pollution control, reviews the types and effects of environmental contaminants including petroleum hydrocarbons, and examines the scientific basis for pollution control, economics of pollution control strategies, and legal, political and international aspects of marine pollution control.

[from Environmental Management 2(5):478. 1978]

80A-0250

GLOBAL MARINE POLLUTION CONTROL AND THE NEW LAW OF THE SEA

Waldichuk, M. 1978.

Implications to Western North Atlantic Countries of the New Law of the Sea. Bermuda Biological Station, 1978. Special Publication No. 14. p. 33-50.

Pollution control, Marine environment, International agreements, *Law of the Sea

Summary not available. [possibly oil pollution related]

80A-0251

AN ARCTIC ATLAS: BACKGROUND INFORMATION FOR DEVELOPING MARINE OILSPILL COUNTERMEASURES [book review]

Walker, E.R. 1979.

Arctic 32(1):88-90.

Contingency planning, Arctic, Marine environment, Canada, Baseline studies, Labrador Sea, Book review

A detailed review is prescribed of the title atlas [Fenco Consultants, Ltd., Calgary, and F.F. Slaney and Co., Ltd., Calgary, 1978. Ottawa, Canada Environmental Protection Service, Environmental Emergency Branch, Research and Development Division, 1978. 481 p.] The atlas contains information on geology, petroleum resources, meteorology, oceanography, ice, biology, and social aspects. "This atlas meets the needs for which it was designed in good fashion . . . [and] covers the subjects of interest to its intended users very well. Most deficiencies exist because the basic data are simply not there."

80A-0252

TECHNIQUES FOR DISPERSING BIRDS FROM OIL SPILL AREAS

Ward, J.G. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.). US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report PB-282 375. p. 113-124.

B. OIL POLLUTION PREVENTION, RESPONSE AND CONTROL
7. General Prevention and Control Measures

Pollution prevention, Birds, Oil spills, *Deterrent devices

The concepts and methods of deterring birds from landing in oil spill areas are discussed. Factors to consider when selecting and evaluating deterrent devices are enumerated, and the various types of devices are briefly reviewed. Devices include greenish-yellow dyes, searchlights and flashing lights, hawks and falcons, distress and alarm calls, sounds of predators, av-alarms, pyrotechnics, gas and electronic exploders, aircraft and remote-controlled model aircraft, and lure areas. The uses of such devices in different habitats, e.g., ponds and lakes, marshes, rivers, coastal areas, offshore areas, ice infested waters, and areas near seabird colonies are evaluated.

80A-0253

OIL PROTECTION AT DRILLING NORTH OF 62ND DEGREE NORTH [in Norwegian]

Westergaard, R.H. 1979.

Norsk Oljerevy 5(4):12.

Pollution prevention, Contingency planning, Risk analysis, Safety,
North Sea, Norway

The Storting Report No. 57 forms the basis for a decision by the Storting about trial drilling north of the 62nd parallel. One-half of the report concerns safety, mainly in relation to the danger of oil spills in the case of an uncontrolled blowout. The relation between oil activity and fishing, and the description of plans for the activity is given. The environmental risk of drilling north of the 62nd parallel is very small, in relation to the importance of mapping the resources.

[from Petroleum Abstracts 20(18):#275,448. 1980]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0254

RAPID TOLUENE UPTAKE A THREAT TO FISH [news brief]

Anon. 1977.

Chemical Engineering News 55(39):26.

Hydrocarbons, Uptake, Metabolism, Fish, *Toluene, *Benzene

In a NOAA study, Pacific herring was exposed to low concentrations of the oil components toluene and benzene. Toluene was found to be accumulated more rapidly than benzene, and both hydrocarbons are metabolized to possibly toxic products. Thus, low level chronic exposure to oil components may pose greater threats to marine organisms than short-lived events such as tanker spills.

80A-0255

EFFECTS OF IRANIAN CRUDE OIL ON LOBSTERS (HOMARUS AMERICANUS) HELD IN FLOAT CRATES

Aiken, D.E. and V. Zitko. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap. Report No. CM1977/E:45. 13 p.

Crude oil, Biological effects, Toxicity, Crustaceans, *Lobsters

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:46, #3893. 1979]

80A-0256

EFFECTS OF INGESTED PETROLEUM ON REPRODUCTION IN A SEABIRD

Ainley, D.G., C.R. Grau, T.E. Roudybush, and S.H. Morrell. 1979.

Pacific Seabird Group Bulletin 6(2):44. Abstract.

Crude oil, Fuel oil, Reproduction, Birds, *Cassins Auklets

A combined field and laboratory study at Southeast Farallon Island and Davis, California, respectively, investigated the effect of ingested oil on reproduction in Cassin's Auklets (Ptychoramphus aleuticus). Three dose levels of bunker C fuel oil and one dose level of Prudhoe Bay crude oil were fed in gelatin capsules to randomly chosen female auklets; control groups were given either an empty capsule or no capsule at all. Each group consisted of 72 to 106 females. Production of eggs hatching and fledging success, and chick growth and survival were compared among the groups. Only egg laying was directly affected. It was inhibited in females that should have laid 9 to 13 days after dosing. The eggs of these females proved to be in the sensitive period of rapid yolk formation when oil was ingested. Such an inhibition of laying would reduce the reproductive success of auklets.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0257

EFFECTS OF COREXIT 9527 ON THE HATCHABILITY OF MALLARD EGGS

Albers, P.H. 1979.

Bulletin of Environmental Contamination and Toxicology 23(4/5):661-668.

Dispersants, Biological effects, Birds, *Mallard embryos, *Hatchability

The results of a study of the toxic effects of Corexit 9527 dispersant, crude oil, and crude oil/Corexit 9527 mixtures on mallard duck embryos are reported. Mallard eggs treated with various crude oil/Corexit 9527 mixtures had significantly lower hatching success rates than untreated controls.

80A-0258

EFFECTS OF OIL ON AQUATIC BIRDS

Albers, P.H. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.),

US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report

PB-282 375. p. 61-68.

Chronic effects, Sublethal effects, Birds, Analytical techniques

Relatively little is known about the sublethal and chronic effects of oil on birds. This paper summarizes research efforts of the Patuxent Wildlife Research Center, Laurel, Maryland, directed at (1) determining the effects of petroleum on the physiology and reproductive success of birds, and (2) developing the analytical methodology necessary for detection of petroleum in avian tissues.

80A-0259

OIL DISPERSANTS AND WILDLIFE

Albers, P.H. 1979.

Proceedings of the 1979 US Fish and Wildlife Service Pollution Response Workshop, 8-10 May, St. Petersburg, Florida. C.H. Brown (ed.). US Fish and Wildlife Service, 1979. p. 67-72.

Dispersants, Crude oil, Biological effects, Toxicity, Birds, Wildlife, *Corexit 9527, *Mallard ducks

The advantages and disadvantages of dispersant usage are reviewed, as are their effects on birds. Recent work with Corexit 9527 indicates that it is at least as toxic to mallard duck embryos as Prudhoe Bay crude oil alone, and the toxic effects of crude oil/Corexit 9527 mixtures appear to increase as the amount of dispersant increases.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0260

EFFECTS OF CRUDE OIL ON BENTHIC BACTERIA OF THE SOUTH TEXAS OUTER CONTINENTAL SHELF

Alexander, S.K., H.S. Chan, C.S. Giam, and J.R. Schwarz. 1978. American Society for Microbiology, 78th Annual Meeting, Las Vegas, Nevada, 1979. R. Slepecky (ed.). Washington, D.C., American Society for Microbiology, 1978. Abstract No. Q76. p. 207.

Crude oil, Benthos, Bacteria, Growth, Acute effects, Chronic effects, OCS, Texas

The title effects were examined in a one year study, using South Louisiana crude oil. The data indicate that addition of the oil results in rapid and long-term changes in growth and composition of benthic bacterial populations, which may affect the natural processes of offshore marine environments.

80A-0261

PHYTOPLANKTON STUDIES IN THE BERING SEA

Alexander, V. 1977.

Environmental Assessment of the Alaskan Continental Shelf. NOAA Outer Continental Shelf Environmental Assessment Program, 1977. p. 357-423.

Crude oil, Phytoplankton, Toxicity, Bering Sea

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:54, #3971. 1979]

80A-0262

DETERMINATION OF THE RATE OF ACCUMULATION OF HYDROCARBONS BY MUSSELS IN CHRONIC POLLUTION CONDITIONS [in French]

Awad, H. 1979.

Science et Pêche, No. 291:9-15.

Mollusks, Uptake, Hydrocarbons, Bioassay, *Chronic pollution, *Mussels

Summary not available.

[from Marine Pollution Research Titles 6(10):#1805. 1979]

80A-0263

EFFECTS OF TOLUENE ON THE SURVIVAL, RESPIRATION, AND ADENYLATE SYSTEM OF A MARINE ISOPOD

Bakke, T. and H.R. Skjoldal. 1979.

Marine Pollution Bulletin 10(4):111-115.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects

Aromatic hydrocarbons, Sublethal effects, Mortality, *Toluene, *Respiration,
*Marine isopods

The purpose of the study was to investigate the sensitivity of the isopod Cirolana borealis toward lethal and sublethal concentrations of toluene, a major aromatic hydrocarbon present in oil. Median times to narcotization (ET_{50}) by various levels of toluene in seawater were determined and results are reported.

80A-0264

SMALL OIL SPILL KILLS 10-20,000 SEABIRDS IN NORTH NORWAY

Barrett, R.T. 1979.

Marine Pollution Bulletin 10(9)253-255.

Birds, Toxicity, Mortality, Fuel oil, Norway, *Brunnich's Guillemots

In March 1979, a spill of a light fuel oil type, the source of the spill unknown, demonstrated the extreme vulnerability of certain seabirds to oil as indicated by the death toll. Over 90% of the birds were Brunnich's Guillemots Uria lomvia; however, the breeding population of this species was not considered to be seriously threatened.

80-0265

CHRONIC EFFECTS OF THREE CRUDE OILS ON OYSTERS SUSPENDED IN ESTUARINE PONDS

Barszcz, C., P.P. Yevich, L.R. Brown, J.D. Yarbrough, and C.D. Minchew. 1978.

Narragansett, Rhode Island, Environmental Research Lab, Report EPA-600/J-78-108, NTIS Report PB-295 378/4SL. 18p.

Chronic effects, Contamination, Mollusks, Crude oil, Estuaries, Sediments, Bioassay, *Oysters

Experimental results indicate a reduced intake and/or assimilation of food by the test animals. Tissues of test animals were clear, watery, and emaciated, in contrast to untreated oysters. Histologically, there were serious alterations in muscle and connective tissue of the body wall, mantle, and food groove, most nearly resembling a condition classically described as hyaline degeneration. Impaired reproductive potential also was noted.

80A-0266

POLYNUCLEAR AROMATIC HYDROCARBONS IN EDIBLE MOLLUSCS AND THEIR ONCOGENIC PROPERTIES

Battaglia, B. 1978.

Luxembourg, Commission of the European Communities, 1978. Final reports on research sponsored under first environmental research programme, EUR 5970. p. 310-312.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

PAH, Mollusks, Marine organisms, *Oncogenic properties

Summary not available. [possibly oil pollution related]

[from Marine Pollution Research Titles 5(10):#1703. 1978]

80A-0267

SENSITIVITY OF THREE MICROALGAE TO CRUDE OILS AND FUEL OILS

Batterton, J.C., K. Winters, and C. Van Baalen. 1978.

Marine Environmental Research, Vol. 1:31-41.

Crude oil, Fuel oil, Biological effects, Toxicity, Algae, *Diatoms, Microorganisms, Aromatic hydrocarbons

Four crude oils and five fuel oils were tested for toxicity with three microalgae--a blue green, a green and a diatom. The crude oils were less inhibitory than equal amounts of fuel oils. Fuel oils inhibited photosynthesis, with O₂ output decreasing to zero without recovery. "The accumulated chemical data suggest that the toxicity of whole fuel oils is due to the less water soluble types of compounds in the higher boiling aromatic fraction."

[from Government Reports Announcements 79(6):84, #PB-289 049/GA. 1979]

80A-0268

MEASUREMENT OF THE RESPONSES OF INDIVIDUALS TO ENVIRONMENTAL STRESS AND POLLUTION: STUDIES WITH BIVALVE MOLLUSCS

Bayne, B.L., M.N. Moore, J. Widdows, D.R. Livingstone, and P. Salkeld. 1979.

Philosophical Transactions of the Royal Society of London [Biology] 286(1015):563-581.

Mollusks, Biological effects, Hydrocarbons, *Mytilus edulis

Physiological differences between individuals in different populations of the mussel, Mytilus edulis, are described, and the results of some experiments on the effects of petroleum hydrocarbons on mussels are presented.

80A-0269

PESTICIDE AND XENOBIOTIC METABOLISM IN AQUATIC ORGANISMS (MICROSOMAL MIXED-FUNCTION OXIDATION IN UNTREATED AND POLYCYCLIC AROMATIC HYDROCARBON-TREATED MARINE FISH)

Bend, J.R. et al. 1979.

American Chemical Society Symposium Series No. 99:297-319.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

Metabolism, PAH, Fish, *Enzyme activity

1, 2, 3, 4-dibenzanthracene-treated and untreated little skates were studied to observe properties of hepatic microsomal aryl hydrocarbon hydroxylase activity in them. Enzyme activity of little skates increased 35 times, following DBA treatment. Results are listed and discussed.

[from Environment Abstracts 9(9):#79-05078. 1979]

80A-0270

TRANSFER OF ^{14}C -TOLUENE FROM MOSQUITO LARVAE TO BLUEGILL SUNFISH

Berry, W.O. and J.W. Fisher. 1979.

Bulletin of Environmental Contamination and Toxicology 23(6):733-736.

Uptake, Hydrocarbons, Food web, Fish, Invertebrates, *Bluegill Sunfish, *Mosquito

This paper reports on the transfer of toluene, one of the main water-soluble fractions of refined petroleum, from fourth-instar mosquito larvae to bluegill sunfish which feed on such larvae. The paper supports the suggestion that bio-accumulation of chemicals within aquatic food chains is insignificant compared to accumulation directly from water.

80A-0271

THE EKOFISK BRAVO BLOWOUT: ZOOPLANKTON, FISH EGGS AND LARVAE

Bjorke, H., E. Ellingsen, and S.A. Iverson. 1977.

International Committee for Exploration of the Sea,

ICES C.M. Pap. Rep., Report No. C.M. 1977/E:55. p. 10:1-10:8.

Ekofisk blowout, North Sea, Biological effects, Zooplankton, Fish, *Eggs and larvae

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:32, #3757. 1979]

80A-0272

THE TOXIC EFFECTS OF THE WATER SOLUBLE FRACTIONS OF NO. TWO FUEL OIL AND OF THREE AROMATIC HYDROCARBONS ON THE BEHAVIOR AND SURVIVAL OF BARNACLE LARVAE

Blundo, R. 1978.

Contributions in Marine Science, University of Texas, Vol. 21:25-37.

Toxicity, WSF, Fuel oil, Aromatic hydrocarbons, Behavior, Sublethal effects, *Barnacle larvae

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

"The deleterious effects of water soluble fractions of No. 2 fuel oil and of three aromatic hydrocarbons, namely naphthalene, benzene, and toluene, on barnacle larvae were investigated. Freshly released nauplii of Balanus eburneus were used; the fuel oil was Exxon (Baytown)." It was concluded that volatile aromatic hydrocarbons are responsible for many of the deleterious effects on activity and survival of barnacle larvae.

80A-0273

EFFECTS OF NO. 2 FUEL OIL, NIGERIAN CRUDE OIL, AND USED CRANKCASE OIL ON BENTHIC ALGAL COMMUNITIES

Bott, T.L. et al. 1979.

Journal of Environmental Science and Health. Part I: Environmental Science and Engineering 13(10):751-780.

Fuel oil, Crude oil, Waste oil, Toxicity, Benthos, Freshwater, Bacteria, Metabolism, Algae, *Communities

The Stroud Water Research Center of Philadelphia compared the effects of three oils on benthic communities consisting of freshwater bacteria, fungi, algae and meiofauna. Oil spills were simulated, and measurements were made to determine the effect of each oil on algal metabolism, algal respiration, net community productivity, and community gross productivity. The crude oil was found to be the most toxic, followed by No. 2 fuel oil and used crankcase oil, in that order.

[from Environment Abstracts 9(7):#79-03843. 1979]

80A-0274

POLLUTED SEABIRDS [book review]

Bourne, W.R.P. 1979.

Marine Pollution Bulletin 10(8):217.

Birds, Book review, Bibliographies, *USFWS, Physical effects

A report on the impact of pollution on seabirds prepared for Seattle symposium has been published as Wildlife Research Report 9 by the US Fish and Wildlife Service, which deals with oil, organochlorines, heavy metals, and plastics and other artifacts.

80A-0275

DOWNREAY OIL SPILL: MAJOR IMPLICATIONS OF A MINOR INCIDENT

Bowman, R.S. 1978.

Marine Pollution Bulletin 9(10):269-273.

Oil spills, Fuel oil, Coasts, Birds, Marine organisms, Scotland

In February 1977, about 17,000 gallons of fuel oil leaked onto the shore near Dounreay, Caithness, Scotland. About 1,000 seabirds were killed, 20-30% of the Balanus population was smothered, and the use of dispersants apparently caused more shoreline devastation than the oil.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0276

THE ACUTE TOXICITY OF SOME PETROCHEMICALS TO GOLDFISH

Bridie, A.L., C.J.M. Wolff, and M. Winter. 1979.

Water Research 13(7):623-626.

Petrochemicals, Toxicity, Acute effects, Fish, Hydrocarbons, *Goldfish

The acute toxicity to goldfish, Carassius auratus, of a number of groups of industrial chemicals derived from petroleum was determined, as well as BOD (biological oxygen demand) and COD (chemical oxygen demand) values. In order of toxic content greater than 5000 mg/l were: glycols, glycol ethers, alcohols, amines, ketones and other industrial chemicals. Less than 5000 mg/l were carboxylic acids and lastly, less than 500 mg/l were epoxy compounds, halogenated hydrocarbons, and hydrocarbons. Time of toxicity testing was 24 hours.

80A-0277

THE EFFECTS OF PRUDHOE CRUDE OIL FRACTIONS ON THE ARCTIC AMPHIPODS

BOECKOSIMUS AFFINIS AND GAMMARUS ZADDACHI

Busdosh, M. 1978.

Dissertation Abstracts International, Section B 39(11):5210-B.

Crude oil, Fuel oil, Mortality, Crustaceans, Arctic, *Amphipods

Toxic effects of whole crude oil and its fractions on the title crustaceans were examined in field and laboratory experiments. High mortalities were associated with the whole crude oil slick, the paraffinic fraction slick and the Arctic diesel oil slick. Low mortalities were observed with the asphaltic fraction.

[from Petroleum Abstracts 20(11):#273,872. 1980]

80A-0278

TOXIC AND GENETIC EFFECTS OF FUEL OIL PHOTOPRODUCTS AND THREE HYDRO-PEROXIDES IN SACCHAROMYCES CEREVISIAE

Callen, D.F. and R.A. Larson. 1978.

Journal of Toxicology and Environmental Health 4(5-6):913-917.

Oxidation, Fuel oil, Toxicity, Mutagens, Yeasts, *Photoproducts, *Hydroperoxides, *Saccharomyces cerevisiae

Results are reported for experiments in which No. 2 fuel oil was UV-irradiated for various times, and the resulting organic hydroperoxides were tested for their toxic effects upon the yeast Saccharomyces cerevisiae. Increased irradiation time increased the toxicity of the photoproducts, and fuel oil that had been irradiated for 12 to 24 hours was capable of inducing gene conversion.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects

80A-0279

FIRTH OF FORTH OIL POLLUTION INCIDENT, FEBRUARY 1978
Campbell, L.H., K.T. Standring, and C.J. Cadbury. 1978.
Marine Pollution Bulletin 9(12):335-339.

Birds, Oil slicks, Mortality, Coastal waters, Harbors, UK

Damage to seaducks and other waterfowl caused by an oil pollution incident is detailed. Only about 250 gal of medium/heavy fuel oil entered sheltered waters near an industrial area at Leith Docks, yet the resulting bird mortality was heavy and sublethal effects were widespread. "This event provided a dramatic example of how even small amounts of oil can be a serious hazard to densely concentrated bird populations."

80A-0280

STUDIES ON THE MYTILUS EDULIS COMMUNITY IN ALAMITOS BAY, CALIFORNIA:
VII. THE INFLUENCE OF WATER-SOLUBLE PETROLEUM HYDROCARBONS ON BYSSAL
THREAD FORMATION
Carr, R.S. and D.J. Reish. 1978.
Veliger 21(2):283-287.

Mollusks, WSF, Hydrocarbons, Concentrations, Biological effects,
California, *Byssal thread formation

Mytilus edulis specimens were exposed to varying concentrations of the water-soluble fraction (WSF) of No. 2 fuel oil, South Louisiana crude oil, and Sta-Lube outboard motor oil. Byssal thread production was significantly inhibited at the 100% WSF for all three oils. An unexpected result of the experiment was the observation of enhancement of byssal thread formation at concentrations of WSFs below those at which the inhibitory effect was elicited.

80A-0281

THE EFFECTS OF CRUDE OIL ON ENZYMES IN THE BROWN SHRIMP (PENNAEUS SP.)
Chambers, J.E., J.R. Heitz, F.M. McCorkle, and J.D. Yarbrough. 1978.
Comparative Biochemistry and Physiology 61C():29-32.

Crude oil, Metabolism, Sublethal effects, Crustaceans, *Brown shrimp,
*Enzymes

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:47, #3901. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0282

ENZYME ACTIVITIES FOLLOWING CHRONIC EXPOSURE TO CRUDE OIL IN A SIMULATED ECOSYSTEM. I. AMERICAN OYSTERS AND BROWN SHRIMP

Chambers, J.E., J.R. Heitz, F.M. McCorkle, and J.D. Yarbrough. 1979. Environmental Research 20(1):133-139.

Crude oil, Chronic effects, Ecosystems, Simulations, Estuaries, Mollusks, Crustaceans, *Oysters, *Shrimp, Enzyme activities

Studied were the enzyme activities in whole-body homogenates from oysters (Crassostrea virginica) and hepatopancreas homogenates from shrimp (Penaeus sp.) exposed to crude oil for 8 months in a simulated estuarine ecosystem. In both organisms, "few chronic alterations in enzyme activity were observed which could be attributed to the oil spill".

[from Chemical Abstracts 91():#205,257q. 1979]

80A-0283

ENZYME ACTIVITIES FOLLOWING CHRONIC EXPOSURE TO CRUDE OIL IN A SIMULATED ECOSYSTEM. II. STRIPED MULLET

Chambers, J.E., J.R. Heitz, F.M. McCorkle, and J.D. Yarbrough. 1979. Environmental Research 20(1):140-147.

Crude oil, Chronic effects, Ecosystems, Simulations, Estuaries, Fish, *Striped mullet, *Enzyme activities

Enzyme activities were studied in brain, gill, liver and muscle homogenates from striped mullet (Mugil cephalus) which were exposed to crude oil for 10 months in a simulated estuarine ecosystem. "In general, there were few chronic alterations in mullet enzyme activities resulting from the oil spill."

[from Chemical Abstracts 91():#205,258r. 1979]

80A-0284

TOXIC EFFECTS OF SOME SURFACTANTS ON THE LARVAE OF MILKFISH AND GRASS SHRIMP [in Chinese]

Chen, H. and C. Chang. 1979.

K'o Hsueh Fa Chan Uyeh K'an 7(7):733-40.

Dispersants, Toxicity, Growth, Fish, Crustaceans, *Milkfish, *Grass shrimp

Milkfish (Chanos chanos) were less susceptible than grass shrimp (Penaeus monodon) to dispersants used for spill cleanup. The least toxic dispersants tested were Seagreen 805 and BP 1100. Sublethal concentrations of dispersant inhibited growth and decreased food consumption in both species. Safe concentrations for shrimp were Dunall 0.5 ppm, BP 1100:0.2 ppm, and Seagreen 805:0.5 ppm; for milkfish, safe concentrations were 0.23 ppm, 5 ppm, and 10 ppm, respectively.

[from Chemical Abstracts 91():#16,512d. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0285

ABSORPTION, DISTRIBUTION, AND EXCRETION OF ETHYLBENZENE, ETHYLCYCLOHEXANE, AND METHYLETHYLBENZENE ISOMERS IN RATS

Chin, B.H., J.A. McKelvey, T.R. Tyler, L.J. Calisti et al. 1980.

Bulletin of Environmental Contamination and Toxicology 24(3):477-483.

Uptake, Metabolism, Depuration, Aromatic hydrocarbons, Animals, *Rats

The purpose of this study is to examine the absorption, distribution, and excretion of the principal components of the petroleum hydrocarbon mixture "60 solvent" in rats. Under the inhalation system employed, this study showed that the principal components of "60 solvent" were absorbed by rats very efficiently during respiration. [possibly oil pollution related]

80A-0286

INFLUENCE OF ENVIRONMENTAL TEMPERATURE ON DISPOSITION OF DIETARY NAPHTHALENE IN COHO SALMON (ONCORHYNCHUS KISUTCH): ISOLATION AND IDENTIFICATION OF INDIVIDUAL METABOLITES

Collier, T.K., L.C. Thomas, and D.C. Malins. 1978.

Comparative Biochemistry and Physiology 61C(1):23-28.

Aromatic hydrocarbons, Fish, Uptake, Metabolism, Chemical analysis, Chromatography, *Coho Salmon, *Naphthalene

"The present study compares the accumulation of dietary naphthalene by coho salmon at 4° and 10°C." Also reported is the use of high-pressure liquid chromatography (HPLC) for the isolation and identification of aromatic hydrocarbon metabolites.

80A-0287

EFFECT OF CRUDE OIL ON A LOUISIANA SPARTINA ALTERNIFLORA SALT MARSH

DeLaune, R.D., W.H. Patrick, and R.J. Buresh. 1979.

Environmental Pollution 20(1):21-30.

Crude oil, Marshes, Plants, Growth, Sediments, *Spartina alterniflora

The effect of Louisiana crude oil on growth of Spartina alterniflora Loisel and selected anaerobic soil processes in a Louisiana salt marsh was investigated. Greenhouse and field studies indicated that S. alterniflora can tolerate a large amount of oil without a short-term decrease in above-ground biomass. Neither the biological reduction of nitrate, manganese, iron and sulphate nor the production of CH₄ and ammonium in stirred reduced sediments were affected by additions of up to 10% oil on a soil-weight basis. Oil placed on the water surface of unstirred sediment caused a release of iron, manganese and ammonium from the sediment to the water because of oxygen absence.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0288

ACUTE AND CHRONIC STUDIES WITH WATERFOWL EXPOSED TO PETROLEUM HYDROCARBONS
Dieter, M.P. 1977.

Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems. C. Hall and W. Preston (eds.). Report EPA/600/7-77/111. p. 35-42.

Hydrocarbons, Acute effects, Chronic effects, Toxicity, Mortality, Birds, Wildlife, Analytical techniques

Embryo toxicity, comparative age mortalities, morphological and biochemical responses from oil ingestion and biochemical reactions of waterfowl are discussed in the title study. Mallards and common eiders were the primary test birds. The development of analytical capability for petroleum hydrocarbons was also studied.

80A-0289

THE INFLUENCE OF HIGH CONCENTRATIONS OF PETROLEUM AND PHENOL ON METABOLISM OF NUCLEIC ACIDS OF ALGAE MACROPHYTES

Divavin, I.A., O.G. Mironov, and I.M. Tsymbal. 1978.

Biologiya Morya, 1978, No. 1:76-78.

Algae, Crude oil, Concentrations, Metabolism, Toxicity, Biological effects

Summary not available.

[from Waste Materials Biodegradation Research Titles 6(4):#79/4-UU-3008, p. 91. 1979]

80A-0290

TOXICITY OF WATER SOLUBLE FRACTIONS OF PETROLEUM OILS ON LARVAE OF CRABS

Donahue, W.H., M.F. Welch, W.Y. Lee, and J. Nicol. 1977.

Pollutant Effects on Marine Organisms. C.S. Giam (ed.). Lexington, D.C. Heath and Company, 1977. Proceedings. p. 77-94.

WSF, Biological effects, Toxicity, Mortality, Crustaceans

"Survival of six species of crabs in WSF's of petroleum oils was investigated. Mortality rates of the crab species at various concentrations are given. In 24 hr experiments, petroleum derivatives, fuel oil, and Bunker C were more toxic than crude oils."

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0291

POLYCYCLIC AROMATIC HYDROCARBON CARCINOGENS IN COMMERCIAL SEAFOODS

Dunn, B.P. and J. Fee. 1979.

Journal of the Fisheries Research Board of Canada 36(12):1469-1476.

PAH, Uptake, Carcinogens, Fish, Mollusks, Crustaceans, Contamination,

*Commercial seafoods, *Creosote

"Fresh and processed commercial seafoods were analyzed for the polycyclic aromatic hydrocarbon carcinogen benzo(a)pyrene using a thin layer chromatographic separation technique and quantitation by fluorescence. Commercial vertebrate fish did not contain detectable levels, most shellfish samples contained generally less than 10 ng/g wet weight, some contained up to 36 ng/g. Crabs and shrimp generally contained less than 0.5 ng/g, and lobsters contained 0.8 to 7.9 ng/g benzo(a)pyrene. Unusually high levels of carcinogens occurred in lobsters which had been kept in creosoted commercial tidal pounds for 3 months (up to 281 ng/g).

80A-0292

METHODS USED AT PATUXENT WILDLIFE RESEARCH CENTER TO STUDY THE EFFECTS OF OIL ON BIRDS

Eastin, W.C., Jr. 1979.

Proceedings of the 1979 US Fish and Wildlife Service Pollution Response Workshop, 8-10 May, St. Petersburg, Florida. C.H. Brown (ed.). US Fish and Wildlife Service, 1979. p. 60-66.

Birds, Metabolism, Development, Chronic effects, Contamination, *USFWS, *Patuxent Wildlife Research Center

Experimental approaches used at Patuxent include indoor pen studies, incubator studies, and outdoor field studies. Results of research indicate that the developmental stages are extremely susceptible to effects of low-level oil contamination, and adult ducks are subjected to increased susceptibility to environmental stresses. Reproduction may also be affected by chronic ingestion of small amounts of oil.

80A-0293

BEHAVIOURAL RESPONSES OF MARINE POIKILOTHERMS TO POLLUTANTS

Eisler, R. 1979.

Philosophical Transactions of the Royal Society of London [Biology] 286(1015):507-521.

Fish, Invertebrates, Marine organisms, Behavior, Monitoring, Bioindicators, Coastal waters

A number of behavioral responses of marine fish and invertebrates which are reportedly capable of disruption or impairment by petroleum and other pollutants are listed, and their potential usefulness for biomonitoring of wastes discharged into coastal environments is discussed.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0294

DEPRESSED FOOD INTAKE AND REDUCED REPRODUCTION IN JAPANESE QUAIL AFTER A SINGLE DOSE OF PRUDHOE BAY CRUDE OIL

Engel, S.E., T.E. Roudybush, J.C. Dobbs, and C.R. Grau. 1978. Developmental Toxicology of Energy-related Pollutants. D.D. Mahlum, M.R. Sikov, P.L. Hackett, and F.D. Andrews (eds.). US Department of Energy, Technical Information Center Report CONF-771017. Proceedings of the Seventeenth Annual Hanford Biology Symposium, Richland, Washington, 17-19 October 1977. p. 27-36.

Crude oil, Acute effects, Birds, Reproduction, *Food intake

Three experiments were conducted as part of a program to assess the possible effects of spilled oil on reproduction of the title seabirds. Results indicate that "a temporary reduction in food intake accounts partially, but not completely, for the adverse effects of a single dose of Prudhoe Bay crude oil on reproductive success of quail".

80A-0295

EFFECTS OF PRUDHOE BAY CRUDE OIL ON PRIMARY PRODUCTION AND ZOOPLANKTON IN ARCTIC TUNDRA THAW PONDS

Federle, T.W., J.R. Vestal, G.R. Hatev, and M.C. Miller. 1979. Marine Environmental Research 2(1):3-18.

Crude oil, Biological effects, Phytoplankton, Zooplankton, Arctic, *Tundra ponds

The title effects were studied under controlled conditions during the summer of 1976 and compared with uncontrolled spills into ponds, conducted one year and six year previously. Results are detailed and discussed.

80A-0296

ECOLOGICAL STUDIES ON HYDROCARBON-OXIDIZING BACTERIA IN JAPANESE COASTAL WATERS---IV. RELATIONS BETWEEN SEVERAL ENVIRONMENTAL CONDITIONS AND POPULATION DENSITY OF HYDROCARBON - OXIDIZING BACTERIA IN SEAWATER OF THE OIL-POLLUTED WATERS AND CHARACTERIZATION OF GROUP COMPOSITION OF BACTERIA [English summary]

Fujisawa, H., M. Murakami, and T. Manabe. 1979. Bulletin of the Japanese Society of Scientific Fisheries 45(9):1099-1107.

Bacteria, Biodegradation, Seawater, Contamination, Statistical analysis, Japan

In the title study of polluted Japanese coastal areas, statistical analyses were conducted that relate bacterial groups and population densities to oil contamination levels, chlorinity, COD, and water temperature. Linear regression analysis indicates a clear relationship between bacterial density and environmental conditions.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0297

FIXATION AND INTRA-CELLULAR ACTIVITIES OF POLLUTANTS [in French]

Gastaud, J.M. 1978.

Revue Internationale Océanographie Medicale 49(3):5-11.

Aromatic hydrocarbons, Toxicity, Marine organisms, Uptake, Metabolism, Biodegradation

The intracellular activities and toxic effects of several pollutants, namely toxic metals, hydrocarbons, chlorinated hydrocarbons, and other organic substances are reviewed.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:40, #3837. 1979]

80A-0298

ON SURVIVAL RATE OF COLON BACILLUS IN OIL-POLLUTED SEAWATER [English summary]

Gerasimenko, D.D. 1977.

Mikrobiologiya Zhurnal 39(6):726-728.

Microorganisms, Bacteria, Seawater, Contamination, *Survival

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:55, #3977. 1979]

80A-0299

HEPATIC MIXED-FUNCTION OXIDASE ACTIVITY IN RAINBOW TROUT EXPOSED TO SEVERAL POLYCYCLIC AROMATIC COMPOUNDS

Gerhart, E.H. and R.M. Carlson. 1978.

Environmental Research 17(2):284-295.

PAH, Fish, *Rainbow trout, *Mixed-function oxidase activity

Effects of polycyclic aromatic hydrocarbons (PAHs) on microsomal liver enzymes were examined in rainbow trout by injecting various PAHs (naphthalene through benzo(a)pyrene) and screening for mixed function oxidase (MFO) activity. Results indicate that PAH tissue concentrations higher than 300 µg/kg would be accompanied by MFO induction in rainbow trout. [possibly oil pollution related]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects

80A-0300

BACTERIOLOGICAL ASPECTS OF FIN EROSION IN MULLET EXPOSED TO CRUDE OIL
Giles, R.C. and L.R. Brown. 1978.
Journal of Fish Biology 13(1):113-117.

Crude oil, Bacteria, Fish, Biological effects, *Mullet, *Fin erosion,
*Bacteriological aspects

The title investigation was undertaken to determine the effects of two types of crude oil on mullet (Mugil aphalus). Results indicate a direct relationship between exposure of the mullet to crude oil and the outbreak of fin rot. The data also indicates that the diversity of external microflora on the mullet was reduced from 5-6 to 1-2 colonial types, one of which was consistently a species of the genus Vibrio.

80A-0301

LACK OF EFFECT OF INGESTED FORTIES FIELD CRUDE OIL ON AVIAN GROWTH
Gorman, M.L. and C.E. Simms. 1978.
Marine Pollution Bulletin 9(10):273-276.

Birds, Growth, Crude oil, Toxicity

Domestic chicks and ducklings were fed 0.1 or 0.5 ml/day of crude oil; herring gull chicks were given 1.0 ml/day. No growth differences were observed between the treated and control birds, which is contrary to other research using Kuwait and Louisiana crude oil. This difference may reflect a true difference in the toxicity of the crude oils used.

80A-0302

RESPONSE OF BENTHIC COMMUNITIES IN MERL EXPERIMENTAL ECOSYSTEMS TO LOW LEVEL, CHRONIC ADDITIONS OF NO. 2 FUEL OIL
Grassle, J.F., R. Elmgren, and J.P. Grassle. 1978.
International Committee for Exploration of the Sea, ICES C.M. Pap. Rep., Report No. C.M. 1978/E:51. 27 p.

Benthos, Ecosystems, Chronic effects, Fuel oil, *MERL experiments

Summary not available.

[from Marine Pollution Research Titles 6(7):#1217. 1979]

80A-0303

ALTERED YOLK STRUCTURE AND REDUCED HATCHABILITY OF EGGS FROM BIRDS FED SINGLE DOSES OF PETROLEUM OILS

Grau, C.R., T. Roudybush, J. Dobbs, and J. Wathen. 1977.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

Biological effects, Toxicity, Birds, *Japanese quail, *Canada geese,
*Egg hatchability

Abstract. Yolk deposited by Japanese quail was abnormal for 24 hours after the oral administration of a single capsule containing 200 milligrams of bunker C oil. Both the structure and the staining properties of the yolk were affected. Fewer eggs were laid during the 4 days after dosing, compared to controls, and hatchability was drastically reduced. Hatchability returned to normal in 4 days. Three other reference oils also affected yolk structure. Canada geese given 2 grams and chickens given 500 milligrams of bunker C oil produced eggs with abnormal yolk rings.

80A-0304

THE EFFECTS OF A SIMULATED REFINERY EFFLUENT ON THE GRASS SHRIMP
PALAEMONETES PUGIO

Hall, L.W., A.L. Buikema, and J. Cairns, Jr. 1978.

Archives of Environmental Contamination and Toxicology 7(1):23-25.

Crustaceans, Wastewaters, Refineries, Toxicity, Fuel oil, *Grass shrimp

A simulated refinery effluent was made containing phenol, sulfide, chromium, ammonia, No. 2 fuel oil, and kaolinite. This mixture contained approximately the concentrations of compounds recommended by the EPA for 1977. Of the six components, No. 2 fuel oil was the most toxic, followed in decreasing order by sulfide, ammonia, phenol, chromium, and kaolinite. Sensitivities of grass shrimp taken from five locations along the Gulf and East Coast of the US were found to be the same.

80A-0305

PRELIMINARY RESULTS FROM POLUMAR III (APRIL 13-18 1978) (SUROIT III) ATP,
PRIMARY PRODUCTION AND RESPIRATION RATES IN SESTON; RESPIRATION RATES IN
ZOOPLANKTON

Hendrikson, P., H.J. Hirche, and U. Junghans. 1978.

Actes des Colloques du Centre National pour l'Exploitation des Oceans,
No. 6:209-224.

Biological effects, Sublethal effects, Zooplankton, Amoco Cadiz spill,
*Neston, *Respiration, *Primary production

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder
and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979.
Supplement 3:29, #3733. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0306

RECENT STATE OF OIL POLLUTION IN THE MARICULTURE FARMS IN SETO INLAND SEA, JAPAN

Hirose, H. 1980.

Marine Sciences and Ocean Policy Symposium--A Definition of the Issues and a Search for a Concensus on Multiple Uses, University of California, Santa Barbara, June 1979. Santa Barbara, California, Committee for the Marine Sciences and Ocean Policy Symposium, 1980. p. 243-247.

Biological effects, Fisheries, Refineries, Japan, *Seto Inland Sea, *Mariculture, *Seaweeds

Because Japan has the world's most extensive mariculture industry, Japan is more sensitive to marine oil pollution and other pollutants than any other country in the world. This paper outlines the adverse effects of oil on seaweeds, with reference to the 1974 accident at the Mizushima Oil Refinery, which resulted in heavy and long lasting damage to the productive Seto Inland Sea.

80A-0307

EFFECTS OF FOUR OILS ON MARINE BACTERIAL POPULATIONS: CONTROLLED ECOSYSTEM POLLUTION EXPERIMENT

Hodson, R.E., F. Azam, and R.F. Lee. 1977.

Bulletin of Marine Science 27(1):119-126.

Crude oil, Petroleum products, Uptake, Toxicity, Microorganisms, Bacteria

Two crude and two refined oils were tested for their effects on the heterotrophic uptake and mineralization of D-glucose-¹⁴C by 1 μ m filterable microbial populations from Saanich Inlet, B.C., Canada. The processed oils were found to be more toxic than the crude oils tested. It was concluded that concentrations of the tested oils in seawater above 300 μ g/l can significantly inhibit marine bacterial activity.

80A-0308

EMBRYOTOXIC AND TERATOGENIC EFFECTS OF PETROLEUM HYDROCARBONS IN MALLARDS (ANAS PLATYRHYNCHOS)

Hoffman, D.J. 1979.

Journal of Toxicology and Environmental Health 5(4):835-844.

Toxicity, Aromatic hydrocarbons, Growth, Birds, *Mallard ducks

Egg surface applications of microliter quantities of petroleum oils of high aromatic content are embryotoxic to mallards and other avian species; applications of aliphatic hydrocarbons have virtually no effect. Affected embryos showed stunted growth as well as increased incidence of abnormalities in survivors. Of the aromatics tested, the tetracyclic compounds, especially chrysene, were most toxic, but individually none were as toxic as the entire mixture.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0309

EMBRYOTOXIC EFFECTS OF CRUDE OIL CONTAINING NICKEL AND VANADIUM IN MALLARDS
Hoffman, D.J. 1979.

Bulletin of Environmental Contamination and Toxicology 23(1/2):203-206.

Crude oil, Toxicity, Birds, Growth, Development, *Mallard ducks, *Nickel,
*Vanadium

High concentrations of nickel and vanadium are contained in certain crude oils. The purpose of this study was to compare the effects of crude oil with and without added vanadium and nickel on embryonic development in mallards. "Embryonic growth was generally more stunted when Ni or V was included in the treatment. The presence of Ni or V resulted in a significantly lower mean embryonic weight at 18 days of development compared with treatment with crude oil alone or to untreated controls." In the presence of Ni and V, rates of abnormalities in surviving embryos were significantly greater than with treatment by crude oil alone.

80A-0310

EFFECTS OF SOME ENVIRONMENTAL POLLUTANTS ON THE ADRENAL CORTEX

Holmes, W.N. and J. Gorsline. 1980.

International Congress of Endocrinology, 6th, Melbourne, Australia,
February 1980. Abstract.

Metabolism, Hydrocarbons, Birds, *Mallard ducks, *Hypoadrenocorticalism

Experiments were conducted which indicate that, similar to the effects of ingestion of chlorinated hydrocarbons, the ingestion of petroleum hydrocarbons by birds results in hypoadrenocorticalism.

80A-0311

EFFECTS OF MILD COLD STRESS ON THE SURVIVAL OF SEAWATER-ADAPTED MALLARD DUCKS (ANAS PLATYRHYNCHOS) MAINTAINED ON FOOD CONTAMINATED WITH PETROLEUM

Holmes, W.N., J. Gorsline, and J. Cronshaw. 1979.

Environmental Research 20(2):425-444.

Crude oil, Biological effects, Birds, Mortality, *Mallard ducks, *Cold and seawater stress

Seawater-adapted mallard ducks have been found to be surprisingly resistant to ingestion of large quantities of crude oil without apparent distress. However, when only small environmental changes, such as sustained mild cold stress, were imposed on test birds, increased rates of mortality frequently followed. The ingestion of petroleum seemed to constitute a nonspecific stressor; birds already exposed to the stress of drinking seawater and persistent cold became more vulnerable to adrenocortical exhaustion, and death frequently ensued.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects

80A-0312

ONSHORE SURVEY OF MACROBENTHOS ALONG THE BRITTANY COAST FOLLOWING THE AMOCO CADIZ OIL SPILL

Hyland, J.L. 1978.

Actes des Colloques du Centre National pour l'Exploitation des Oceans, No. 6:175-192.

Distribution, Mortality, Sublethal effects, Benthos, Marine organisms, France, Coastal waters, Amoco Cadiz spill

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:30, #3736. 1979]

80A-0313

PETROLEUM HYDROCARBONS AND THEIR EFFECTS ON MARINE ORGANISMS, POPULATIONS, COMMUNITIES, AND ECOSYSTEMS

Hyland, J.L. and E.D. Schneider. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap. Report No. C.M. 1977/E:64. 42 p.

Marine organisms, Biological effects, Hydrocarbons, Ecosystems, Habitats

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:59, #4016. 1979]

80A-0314

A SURVEY OF PETROLEUM HYDROCARBONS IN ELEFSIS BAY, AEGEAN SEA, AND THEIR EFFECT ON PHYTOPLANKTON GROWTH

Ignatiades, L. and N. Mimikos. 1977.

Monaco, Commission Internationale pour l'Exploration Scientifique de la Mer Méditerranée. II^{es} journées d'études sur les pollutions marines . . . Protection du littoral Méditerranéen:139-142.

Hydrocarbons, Distribution, Sampling, Biological effects, Phytoplankton, Growth

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:56, #3985. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0315

THE EKOFISK BRAVO BLOWOUT: MICROBIAL COUNTS IN THE EKOFISK AREA OF THE NORTH SEA

Indrebo, G. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap. Rep., Report No. C.M. 1977/E:55. p. 7:1-7:2.

Ekofisk blowout, North Sea, Microorganisms

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:32, #3763. 1979]

80A-0316

POLYCYCLIC AROMATIC HYDROCARBONS IN THE AQUATIC ENVIRONMENT [Review]

Jenkins, S.H. 1979.

Water Research 14(1):85-86.

PAH, Aquatic environment, Marine organisms, Mollusks, Uptake, Depuration, Distribution

Some of the PAH are carcinogenic to mammals. PAH are synthesized both from industrial activities and biologically in aqueous environments. Significant amounts are found in sewage and storm water runoff which cannot be measured as accurately as amounts found in rivers, lakes and man-made reservoirs. PAH may be degraded by ozone or other oxidizing agents, photo-oxidized by ultraviolet radiation. Marine organisms tend to accumulate and release PAH, especially the mollusks.

80A-0317

THE EFFECTS OF CRUDE OILS ON REPRESENTATIVE SPECIES OF MARINE PHYTOPLANKTON

Johnson, J.J. 1977.

University of Southern Mississippi, Ph.D. Dissertation, 1977. 180 p.

Aromatic hydrocarbons, Crude oil, Phytoplankton, Toxicity, Metabolism

Emulsified crude oil was up to 500 times more toxic to Skeletonoma costatum than were soluble extracts. Of the crude oils tested, Nigerian was the most toxic, Venezuelan was least toxic; toxicity was directly correlated with the presence of large amounts of medium boiling point aromatic hydrocarbons, especially naphthalene and methylnaphthalene.

[from Dissertation Abstracts International B 38(10):#4617B. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0318

BIRDS OILED DURING THE AMOCO CADIZ INCIDENT--AN INTERIM REPORT
Jones, P.H., J.-Y. Monnat, C.J. Cadbury, and T.J. Stowe. 1978.
Marine Pollution Bulletin 9(11):307-310.

Amoco Cadiz spill, Birds, Mortality, English Channel, France

Over 4500 oiled birds were collected from beaches in Northwest France and the Channel Islands in March 1978. Auks were the most abundant casualties: 1391 puffins Fratercula arctica, 978 razorbills Alca torda and 731 guillemots Uria aalge, also 126 divers Gavia spp. A total of 33 bird species were recorded oiled and a corpse drift experiment suggested that after 30 March at least 3450 seabirds died off north Finistère alone.

80A-0319

SHORT TERM EFFECTS OF HYDROCARBONS ON THE PHOTOSYNTHESIS AND RESPIRATION OF SOME PHYTOPLANKTON SPECIES
Karydis, M. 1979.
Botanica Marina 22(5):281-285.

Hydrocarbons, Crude oil, Acute effects, Phytoplankton, *Photosynthesis, *Respiration

In the title study, high crude oil concentrations caused inhibition of photosynthesis activity in three planktonic algae species. Low concentrations stimulated photosynthesis. Toxicity levels seem to correlate with the cell wall which may play a protective role. Effects on respiration were less severe compared to photosynthesis.

80A-0320

UPTAKE OF HYDROCARBONS BY THE MARINE DIATOM CYCLOTELLA CRYPTICA
Karydis, M. 1980.
Microbial Ecology 5(4):287-293.

Uptake, Hydrocarbons, Toxicity, Microorganisms, *N-alkanes, *Diatoms

The uptake of endogenous hydrocarbons by phytoplankton was studied, particularly N-alkanes. It was shown that hydrocarbons dispersed in seawater easily reach the cellular surfaces of C. cryptica. The uptake of n-alkanes in C. cryptica was found to be a largely non-selective process suggesting the likelihood of serious effects if toxic hydrocarbons such as aromatics are present in the seawater.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0321

BACTERIAL SUCCESSION IN CLOSED SYSTEMS INCUBATED WITH AND WITHOUT SOUTH LOUISIANA CRUDE OIL

Kaster, A.G. and O.W. Van Auken. 1978.

American Society for Microbiology, 78th Annual Meeting, Las Vegas, Nevada, 1978. R. Slepecky (ed.). Washington, DC, American Society for Microbiology, 1978. Abstract No. Q79. p. 208.

Crude oil, Bacteria, Biological effects, *Closed systems, *Bacterial successions

In the title study, water samples incubated with and without the crude oil for eight weeks were analyzed; no major differences in bacterial succession patterns were determined. The results indicate that in the closed systems, a new population equilibrium is established within the first two weeks. This equilibrium is characterized by a higher population and a lower species richness.

80A-0322

FILTRATION CAPACITY OF SOME MOLLUSCS OF THE CASPIAN SEA

Kasymov, A.G. and N.F. Likhodeyeva. 1979.

Water, Air, and Soil Pollution 11(3):279-288.

Toxicity, Crude oil, Mollusks, Caspian Sea, USSR, Filtration, Growth, Contamination

"Experimental studies were conducted of the filtration rate of molluscs (Mytilaster lineatus, and Cerastoderma lamarckii) in solutions of yeast, clay, and of three species of oils (Sangachaly, Artem, and Neftyanye Kamni oil fields) which contaminate the Caspian Sea. The filtration rate proved to be in direct proportion to the dimensions of individuals, and in inverse proportion to the concentration of solution. The oil of Neftyanye Kamni proved to be the most toxic, and that of Sangachaly--the least toxic. C. lamarckii is the most active filtration organism."

80A-0323

INFLUENCES OF HEAVY OILS ON THE EARLY DEVELOPMENT IN PORPHYRA CULTURE [in Japanese]

Katayama, K. 1977.

Bulletin of the Fisheries Experimental Station of the Okoyama Prefecture, Vol 1976 (published 1977):165-169.

Biological effects, Petroleum products, Development, Metabolism, *Porphyra sp.

Summary not available.

[from Marine Pollution Research Titles 5(9):#1573. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0324

PHYSIOLOGICAL AND MORPHOLOGICAL CHANGES IN A COLD TORPID MARINE FISH UPON ACUTE EXPOSURE TO PETROLEUM

Kiceniuk, J.W., G.L. Fletcher, and R. Misra. 1980.

Bulletin of Environmental Contamination and Toxicology 24(2):313-319.

Metabolism, Biological effects, Fish, Statistical analysis, Acute effects

The results of this experiment indicate that oil exposure can result in physiological changes in cunner fish after two weeks of exposure. "Some of the statistical methods used in this report have never been employed before in this type of study. One of the objectives of this presentation is to draw the attention of the reader to the potential scope that these analyses may have in similar studies."

80A-0325

EFFECTS OF OIL TRANSFERRED FROM INCUBATING GULLS TO THEIR EGGS

King, K.A. and C.A. Lefever. 1979.

Marine Pollution Bulletin 10(11):319-321.

Birds, Mortality, Reproduction, Fuel oil, *Laughing gulls

The results of the title study confirm that No. 2 fuel oil can cause significant embryo mortality in Laughing gulls. When the oil was transferred from the adult breast to eggs the mortality rate was 41%, in direct application of oil to the eggs, the mortality rate was 83%.

80A-0326

RESUSPENSION OF OIL: PROBABLE CAUSE OF BROWN PELICAN FATALITY

King, K.A., S. Macko, P.L. Parker, and E. Payne. 1979.

Bulletin of Environmental Contamination and Toxicology 23(6):800-805.

Mortality, Birds, Marshes, Contamination, Toxicity, *Resuspension

"The death of an individual of an endangered bird species 6 weeks after the original spill emphasizes that not all mortality associated with oil spills is immediate and obvious. Oil spilled in salt marshes persists for long periods; consequently special attention must be paid to these areas. Resuspension of oil trapped in pools or in sediments can result in the recontamination of adjacent waters. This is the first instance of which we are aware that resuspended oil may have resulted in bird mortality."

80A-0327

EFFECTS OF POLLUTANTS ON AQUATIC ORGANISMS [book review]

Klaverkamp, J.F. 1979.

Journal of the Fisheries Research Board of Canada 36(10):1294.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

Toxicity, Marine organisms, Hydrocarbons, Petroleum products, Metabolism, Sublethal effects, Book review

The title book [APM Lockwood (ed.). London, Cambridge University Press, 1976. x+ 193 p.] is reviewed. The book is designed to present a wide variety of experimental approaches to pollution and to serve as an introduction to aquatic toxicology. Among the topics discussed are: toxicity, uptake, distribution, metabolism, release, tainting and sublethal effects of petroleum hydrocarbons on marine zooplankton and fish and effects of petroleum on algae, with emphasis on algal photosynthesis.

80A-0328

THE UPTAKE, DISTRIBUTION, AND DEPURATION OF ^{14}C BENZENE AND ^{14}C TOLUENE IN PACIFIC HERRING, CLUPEA HARENGUS PALLASI

Korn, S., N. Hirsch, and J.W. Struhsaker. 1977.
Fishery Bulletin 75(3):633-636.

Aromatic hydrocarbons, Uptake, Metabolism, Depuration, Fish, *Pacific herring, *Benzene, *Toluene

"In this study, a comparison of the uptake, distribution, and depuration of ^{14}C benzene and ^{14}C toluene, at a low sublethal concentration (100 ppb) was undertaken to determine which of these prevalent aromatics may pose the greatest problem." In all herring tissue toluene accumulated to higher levels than did benzene, and it did so rapidly. Thus "toluene would appear to be potentially a greater problem to fish . . . after even a brief contact during an oil spill."

80A-0329

EXPERIMENTAL STUDY OF THE INFLUENCE OF PETROLEUM PRODUCTS ON THE PRIMARY PRODUCTIVITY OF THE MARINE ENVIRONMENT

Lacaze, J.C. 1978.

Paris, Museum National d'Histoire Naturelle, 1977. 469 p.

Biological effects, Petroleum products, Marine organisms, Microorganisms, Marine environment

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:56, #3989. 1979]

80A-0330

EXPERIMENTATION ON CONTROLLED MARINE ECOSYSTEMS. APPLICATIONS IN POLLUTION BY FUEL PRODUCTS [in French]

Lacaze, J.C. 1979.

Oceanis, Vol. 4:423-611.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects

Ecosystems, Marine organisms, Petroleum products, Biological effects
Summary not available.

[from Marine Pollution Research Titles 6(10):#1829. 1979]

80A-0331

THE EKOFISK BRAVO BLOWOUT: A NOTE ON OBSERVATIONS OF FISH IN THE AREA
OF EKOFISK BRAVO

Lahn-Johannessen, J., O. Smedstad, and E. Bakken. 1977.
International Committee for Exploration of the Sea, ICES C.M. Pap. Rep.,
Report No. C.M. 1977/E:55. p. 11:1-11:13.

Ekofisk blowout, North Sea, Fish

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder
and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979.
Supplement 3:33, #3765. 1979]

80A-0332

THE EKOFISK BRAVO BLOWOUT: NET- AND NANOPLANKTON: EFFECTS OF THE
BRAVO OIL SPILL

Lannergren, C. 1977.
International Committee for Exploration of the Sea, ICES C.M. Pap. Rep.,
Report No. C.M. 1977/E:55. p. 9:1-9:5.

Ekofisk blowout, North Sea, Biological effects, Plankton

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder
and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979.
Supplement 3:33, #3766. 1979]

80A-0333

NET- AND NANOPLANKTON: EFFECTS OF AN OIL SPILL IN THE NORTH SEA

Lannergren, C. 1978.
Botanica Marina, Vol. 21:353-356.

Oil spills, Biological effects, Plankton, North Sea

Summary not available.

[from Marine Pollution Research Titles 5(10):#1711. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0334

INTERACTIVE EFFECTS OF SALINITY, TEMPERATURE AND POLYCYCLIC AROMATIC HYDROCARBONS ON THE SURVIVAL AND DEVELOPMENT RATE OF LARVAE OF THE MUD CRAB RHITHROPANOPEUS HARRISII

Laughlin, R.B., Jr. and J.M. Neff. 1979.

Marine Biology 53(3):281-291.

PAH, Crustaceans, Toxicity, Mortality, Development, *Mud crabs, *Naphthalene, *Phenanthrene, *Salinity and temperature effects

This paper reports the survival and development rate of the zoeal stages of the title organism when exposed separately to the petroleum hydrocarbons phenanthrene or naphthalene, along with variations in salinity and temperature. Phenanthrene was much more toxic than naphthalene, and naphthalene was not acutely toxic at any combination of physical factors or naphthalene concentration tested (up to 500 ppb). Both compounds caused the highest mortality at low salinities of 5%.

80A-0335

A LONG-TERM STUDY OF THE EFFECTS OF WATER-SOLUBLE FRACTIONS OF NO. 2 FUEL OIL ON THE SURVIVAL, DEVELOPMENT RATE, AND GROWTH OF THE MUD CRAB RHITHROPANOPEUS HARRISII

Laughlin, R.B., Jr., L.G.L. Young, and J.M. Neff. 1978.

Marine Biology 47(1):87-95.

WSF, Fuel oil, Concentrations, Toxicity, Chronic effects, Crustaceans, *Mud crabs

Mud crabs were raised from planktonic larval stages through juvenile crab stages while exposed for 6 mos. continuously to varying concentrations of water-soluble fractions (WSF) of No. 2 fuel oil. The mud crabs, *Rhithropanopeus harrisi*, are most sensitive to WSF at zoeal stages, but surviving individuals appear to possess considerable ability to recover from the effects of chronic sublethal exposure.

[from Petroleum Abstracts 20(18):#275,451. 1980]

80A-0336

FATE OF PETROLEUM HYDROCARBONS IN MARINE ANIMALS

Lee, R.F. 1977.

OCEANS '77 Conference Record, Vol. 2:Paper 40C. 4 p.

Hydrocarbons, Uptake, Metabolism, Marine organisms, Bioindicators, Mollusks, Annelids, Crustaceans, *Detoxification mechanisms

The various hydrocarbon detoxification mechanisms in crabs, worms and fish are compared with the accumulation of hydrocarbons in bivalves. Bivalves, lacking the detoxification mechanisms, are being investigated as bioindicators of marine pollution.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects

80A-0337

INDIVIDUAL AND COMBINED TOXICITY OF SOME PETROLEUM AROMATICS TO THE MARINE AMPHIPOD ELASMUS PECTENICRUS

Lee, W.Y. and J.A.C. Nicol. 1978.

Marine Biology 48(3):215-222.

Toxicity, Aromatic hydrocarbons, Fuel oil, Marine organisms, *Amphipods, *Elasmus pecteniscrus

Of the four aromatic hydrocarbons tested, two ephemeral aromatics naphthalene (A), and 1,2,4-trimethylbenzene (B), were more toxic than two persistent aromatics, o-cresol (C) and o-toluidine (D). Of single components tested, A was most toxic; tests of the combined toxicity of 2 and 3 components showed that the combinations AD and ABD were the most toxic, respectively. Tests of whole water soluble fractions (WSF) indicate the possibility of synergistic effects.

80A-0338

EFFECT OF CRUDE OIL ON THE FORMATION OF THE SHELL IN MYTILUS EDILUS

[English summary]

Le Pennel, M. and S. Le Roux. 1979.

Revue internationale Océanographie Médicale Vol. 55:49-55.

Crude oil, Biological effects, Growth, Development, Mollusks, *Mytilus edulis

Spawned eggs of Mytilus edulis, exposed to two crude oils, produced larvae which formed abnormal prodisso-conch shells. A light microscope and scanning electron microscope disclosed great modifications of the hinge and shell crystallization.

[from Marine Pollution Research Titles 7(2):#319. 1980]

80A-0339

FIRST SERIES OF RESULTS ON THE TOXICITY OF CRUDE OIL FROM THE AMOCO CADIZ
[in French]

Le Roux, S. and A. Lucas. 1978.

Actes des Colloques du Centre National pour l'Exploitation des Oceans, No. 6:215-226.

Toxicity, Marine organisms, Crude oil, Amoco Cadiz spill

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:30, #3741. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0340

EFFECTS OF PETROLEUM HYDROCARBONS ON LENGTH OF INCUBATION AND HATCHING SUCCESS IN THE JAPANESE MEDAKA

Leung, T.S. and R.V. Bulkley. 1979.

Bulletin of Environmental Contamination and Toxicology 23(1/2):236-243.

Crude oil, Concentrations, Hydrocarbons, Fish, Growth, Development, *Embryos, *Japanese medaka

A significant decrease in length of the egg incubation period and an increase in the opercular movement of unhatched fish embryos was noted while testing different crude oils on various life stages of Japanese medaka, Oryzias latipes. The concentration of crude oil and the age of the embryos at the time of exposure produce, in part, specific effects. This study discusses these effects and their probable interrelations.

80A-0341

PHYSIOLOGY OF SALINITY-DEPENDENT NAPHTHALENE TOXICITY IN FUNDULUS HETEROCLITUS

Levitan, W.M. and M.H. Taylor. 1979.

Journal of the Fisheries Research Board of Canada, 36(6):615-620.

Aromatic hydrocarbons, Toxicity, Fish, Uptake, Metabolism, *Fundulus heteroclitus, *Naphthalene, *Salinity

"The influence of salinity on mortality mummichogs, Fundulus heteroclitus, subjected to naphthalene and the physiological bases for the salinity-dependent mortalities were determined." Conditions of hyperosmotic salinity resulted in greater naphthalene uptake, osmotic imbalance, and metabolic stress. Hyperosmotic salinities may contribute to the increased mortality of naphthalene-exposed fish acclimated to hyperosmotic salinities.

[from Marine Pollution Research Titles 6(10):#1830. 1979]

80A-0342

OIL POLLUTION AND SEABIRDS: ATLANTIC CANADA 1976-77 AND SOME IMPLICATIONS FOR NORTHERN ENVIRONMENTS

Levy, E.M. 1980.

Marine Pollution Bulletin 11(2):51-56.

Birds, Oil spills, Atlantic coast, Canada, Cold climates, Chemical analysis, Contamination, Argo Merchant spill, *Grand Zenith spill

Chemical analyses of the oils on dead seabirds from Atlantic Canada during the winter of 1976-77 indicate the birds were contaminated by the Argo Merchant grounding, the Grand Zenith disaster and a number of other small local spills. The birds demonstrated that only a minute oiling combined with the synergistic effects of severe environmental conditions leads to death.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0343

THE TSEIS OIL SPILL: ITS IMPACT ON THE COASTAL ECOSYSTEM OF THE BALTIC SEA

Lindén, O., R. Elmgren, and P. Boehm. 1979

Ambio 8(6):244-253.

Acute effects, Marine organisms, Fuel oil, Baltic Sea, Coastal waters,
*Tseis spill

This article summarizes a major study on the effects of the title spill on the ecosystem of a sheltered coastal archipelago in the atidal brackish Baltic Sea. Although the spill was minor by international standards - 1000 tons of medium grade fuel oil - the marine ecosystems suffered severe effects.

80A-0344

IMPACT OF CRUDE OIL ON ROOT RESPIRATION AND LEVELS OF SOLUBLE SOIL CELLULOSE IN COASTAL ARCTIC TUNDRA

Linkins, A.E., R.K. Antibus, O.K. Miller, and G.A. Laursen. 1978.

Environmental Chemistry and Cycling Processes. D.C. Adriano and J.L. Brisbin, Jr. (eds.). US Department of Energy, Technical Information Center, Report CONF-760429, Proceedings. p. 590-604.

Biological effects, Metabolism, Vegetation, Soil, Arctic, *Tundra, *Roots, *Soil cellulose

In the title study, application of Prudhoe crude oil caused significant decreases in respiration and changes in the oxidative metabolism of all roots examined. A greater perturbation of root respiration occurred at lower temperatures, and levels of soluble soil cellulose were lowered in the presence of oil in the soil.

80A-0345

A TOXICOLOGICAL EVALUATION OF A PLASTIC OIL ABSORBENT

Lønning, S. and B.E. Hagström. 1978.

Marine Pollution Bulletin 9(10):276-278.

Sorbents, Absorption, Product information, Performance testing, Toxicity, Marine organisms

Results of experiments indicate that "Oil Killer", a plastic oil absorbent acts as an almost inert nontoxic substance. "The Oil Killer dissolves in the presence of methylene chloride but in spite of this no negative effects were recorded. In combination with crude oil the Oil Killer seems rather to reduce the serious ill effects exerted by oil alone." Organisms tested included sea urchins, flatfishes, and planktonic organisms, particularly copepods.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects

80A-0346

BIOAVAILABILITY OF A HYDROCARBON FROM WATER AND SEDIMENT TO THE MARINE WORM ARENICOLA MARINA

Lyes, M.C. 1979.

Marine Biology 55(2):121-127.

Hydrocarbons, Seawater, Sediments, Contamination, Uptake, *Release, Annelids, *Arenicola marina, *Naphthalene

The uptake, accumulation, and release of labelled naphthalene by the title annelid was examined. Naphthalene was selected as an important oil component, and one known to be toxic to marine life. "The bioavailability of the hydrocarbon to the worm from contaminated sediment is examined and the results discussed with reference to the rehabilitation of oiled environments, as A. marina is thought to be capable, in high numbers, of greatly reworking sediments."

80A-0347

THE ACUTE EFFECT OF BUNKER C OIL AND AN OIL DISPERSANT: PART 1 - SERUM GLUCOSE, SERUM SODIUM AND GILL MORPHOLOGY IN BOTH FRESHWATER AND SEAWATER ACCLIMATED RAINBOW TROUT (SALMO GAIRDNERI)

McKeown, B.A. and G.L. March. 1978.

Journal Water Pollution Control Federation, Vol. 12:157-163.

Crude oil, Dispersants, Fish, Acute effects, *Salmo gairdneri, *Serum glucose and sodium, *Gill morphology

In the title study, both compounds tended to decrease serum glucose levels with Bunker C causing the more significant decrease and indicating possible dysfunction of the kidney. Freshwater trout showed a decrease in Na levels, and saltwater-acclimated fish showed a marked increase in Na levels when treated with a dispersant. Gill tissue showed severe damage caused by dispersant and oil/dispersant mixtures; Bunker C exposure alone caused less damage to these tissues.

80A-0348

THE EFFECTS OF BUNKER C OIL AND AN OIL DISPERSANT: PART 2 - EFFECTS ON THE ACCUMULATION OF CHLORINE-LABELLED BUNKER C OIL IN VARIOUS FISH TISSUES

McKeown, B.A. and G.L. March. 1978.

Marine Environmental Research 1(1):119-123

Fuel oil, Dispersants, Biological effects, Uptake, Fish

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:44, #3878. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0349

SUBLETHAL EFFECTS ON SEAGRASS PHOTOSYNTHESIS

McRoy, C.P. and S.L. Williams. 1977.

Environmental Assessment of the Alaskan Continental Shelf, Vol. 12. Effects. NOAA Outer Continental Shelf Environmental Assessment Program, 1977. p. 636-673.

Sublethal effects, Alaska, Plants, *Seagrass photosynthesis

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:56, #3990. 1979]

80A-0350

METABOLIC FATE OF AROMATIC HYDROCARBONS IN AQUATIC ORGANISMS: ANALYSIS OF METABOLITES BY THIN-LAYER CHROMATOGRAPHY AND HIGH-PRESSURE LIQUID CHROMATOGRAPHY

Malins, D.C., T.K. Collier, L.C. Thomas, and W.T. Roubal. 1979.

Recent Advances in Environmental Analysis. R.W. Frei (ed.). New York, Gordon and Breach Science Publishers, 1979. p. 337-354.

Chemical analysis, Aromatic hydrocarbons, Fish, Metabolism, Chromatography, *Metabolites

"Aquatic organisms convert aromatic hydrocarbons into a variety of conjugated and nonconjugated derivatives. Analytical techniques based on thin-layer chromatography (TLC) and high-pressure liquid chromatography (HPLC) were employed to separate, identify and quantitate individual metabolites from fish exposed to radiolabeled naphthalene and 2,6-dimethylnaphthalene. Significant differences in profiles of individual metabolites were found in relation to the type of biological sample analyzed."

80A-0351

EFFECTS OF THREE OIL SPILL DISPERSANTS ON MARINE BACTERIAL POPULATIONS

Marty, D., A. Bianchi, and C. Gatellier. 1979.

Marine Pollution Bulletin 10(10):285-87.

Biological effects, Dispersants, Microorganisms, Bacteria, Statistical analysis, Product information

Three hydrocarbon dispersant agents, Corexit 9527, Hydrogamosol LT and OSR LT 126, were tested for their effect on the bacterial flora of the marine environment. Under the project conditions the agents produced an increase in the aerobic heterotrophic bacterial population numbers considerably greater than the project's untreated oil slick. Statistical breakdowns of bacterial populations are included and discussed.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects

80A-0352

AMOCO CADIZ OIL DISASTER. THE RINGING RECOVERIES

Mead, C.J. 1978.

BTO News 93(1):1-2.

Birds, Mortality, Amoco Cadiz spill, UK, *Auks

Summary not available.

[from Marine Pollution Bulletin 9(11):310. 1978]

80A-0353

DISTRIBUTION AND ELIMINATION OF NAPHTHALENE AND 2-METHYLNAPHTHALENE IN RAINBOW TROUT DURING SHORT- AND LONG-TERM EXPOSURES

Melancon, M.J. and J.J. Lech. 1978.

Archives of Environmental Contamination and Toxicology 7(2):207-220.

Uptake, *Accumulation, Depuration, Fish, PAH, Acute effects, Chronic effects, *Rainbow trout, *Naphthalene

The accumulation and elimination of ^{14}C in trout tissues following short- and long-term exposures to aqueous extracts of the title petroleum hydrocarbons were studied. Results indicate that "2-methylnaphthalene is taken up more rapidly . . . , initially accumulated to higher levels in all tissues studied, stored in muscle to a much greater extent as parent compound, and eliminated more rapidly from muscle, liver and blood. Over long periods of time, exposure of trout to naphthalene might lead to higher tissue levels of parent compound and metabolites than would be the case with 2-methylnaphthalene."

80A-0354

AMOCO-CADIZ: INFORMATION ON THE CONTAMINATION OF EXPLOITED SPECIES [in French]

Michel, P. and A. Abarnou. 1978.

Actes des Colloques du Centre National pour l'Exploitation des Oceans, No. 6: 143-150.

Contamination, Fisheries, Mollusks, Fish, Crustaceans, France, Amoco Cadiz spill

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:31, #3744. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects

80A-0355

EFFECT OF PRUDHOE CRUDE OIL ON CARBON ASSIMILATION BY PLANKTONIC ALGAE IN AN ARCTIC POND

Miller, M.C., G.R. Hater, and J.R. Vestal. 1978.
Environmental Chemistry and Cycling Processes. D.C. Adriano and
I.L. Briskin, Jr. (eds.). US Department of Energy, Technical Information
Center, Report CONF-760429. p. 833-850.

Crude oil, Metabolism, Plankton, Algae, Lakes, Biomass, Arctic

In the summer of 1975, crude oil was experimentally spilled on a coastal pond similar to the ponds around Prudhoe Bay, and differences in algal production, biomass, and species composition were compared with an adjacent control pond. Planktonic primary productivity was initially inhibited but recovered slowly. Algal density did not change, but biomass and species composition was changed. Effects of oiling on phytoplankton were not significantly different from effects observed after an earlier spill at 45 times the 1975 dose.

80A-0356

OIL AND MARINE ORGANISMS

Mironov, O.G. 1978.

First American-Soviet Symposium on the Biological Effects of Pollution on Marine Organisms. T.W. Duke and A.I. Simonov (eds.). Gulf Breeze, Florida, Office of Research and Development, 1978. Report EPA-600/9-78-007. p. 138-143.

Marine organisms, Contamination, Oil spills, Acute effects, Chronic effects

A general review of the problem of marine oil pollution, and its acute and chronic effects on marine organisms and communities is presented.

[from Marine Pollution Research Titles 6(7): #1245. 1979]

80A-0357

OIL CHANGE IN EXCRETORY PRODUCTS OF MUSSELS (MYTILUS GALLOPROVINCIALIS)

Mironov, O.G. and T.L. Shchekaturina. 1979.

Marine Pollution Bulletin 10(8):232-234.

Mollusks, Metabolism, Biological effects, Uptake, *Mytilus galloprovincialis

"Oil ingested by mussels appears in the faeces and pseudofaeces but differs in composition from the oil to which the animals are exposed . . . There is evidence that these changes are the result of metabolic processes in the mussels."

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0358

ECOLOGICAL STUDIES ON HYDROCARBON - OXIDIZING BACTERIA IN JAPANESE COASTAL WATERS - III. INFLUENCE OF OIL POLLUTION ON POPULATION DENSITY OF HYDROCARBON-OXIDIZING BACTERIA [English summary]

Murakami, M., H. Fujisawa, and T. Manabe. 1979.

Bulletin of the Japanese Society of Scientific Fisheries 45(9):1091-1098.

Biodegradation, Hydrocarbons, Bacteria, Seawater, Sediments, Statistical analysis, Japan

A statistical analysis of data collected in the title study was conducted to clarify the influence of oil pollution on hydrocarbon-oxidizing bacterial populations, and on heterotrophic bacterial populations in coastal seawater and sediments. Both bacterial groups exhibited a significant positive correlation between population density and presence of oil pollution, both in seawater and in bottom sediments.

80A-0359

ASSESSING THE BIOLOGICAL IMPACT OF OIL SPILLS: A NEW ROLE FOR EPA BIOLOGISTS Nadeau, R.J. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.).

US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report PB-282 375. p. 55-60.

Biological effects, Environmental effects, Ecosystems, Wildlife, EPA, *USFWS

Factors affecting oil spill impacts include: The type and volume of oil spilled, the hydrography of the impacted area, and spill response and cleanup methods applied. The biological effects on living systems may vary from massive mortality due to coating, contact, asphyxiation, to the incorporation of sublethal amounts sufficient to increase sensitivity to stress and infection. In spill response, the EPA biologist's role differs from that of the US Fish and Wildlife Service biologist, and these differing philosophies and responsibilities are discussed.

80A-0360

POLLUTION SELECTION OF ALLOZYME POLYMORPHISMS IN BARNACLES

Nevo, E., T. Shimony, and M. Libni. 1978.

Experientia 34(11):1562-1564.

Ports, Petrochemicals, Mediterranean Sea, Biological effects, Crustaceans, *Barnacles

The subtropical acorn barnacle, Balanus amphitrite was tested for allozymic variation in proteins. The barnacles were from 3 sites varying in pollution levels in the Mediterranean Haifa Bay. The 3 sites respectively were a relatively unpolluted bay, a petroleum polluted port, and a petrochemically polluted dockyard. Significant correlation was found between pollution and allozymic variation, and the correlation was such that it suggests that in barnacles, different allozymic variants function optimally in different polluted environments.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects

80A-0361

EFFECTS OF PETROLEUM ON ADULTS AND LARVAE OF THE AMERICAN OYSTER
CRASSOSTREA VIRGINICA GMELIN

Noyes, G.S. 1978.

New Brunswick, New Jersey, Rutgers University Ph.D. Dissertation. 189 p.

Crude oil, Fuel oil, Toxicity, Mortality, Chronic effects, Mollusks,
Delaware, Estuaries, *Crassostrea virginica

Chronic effects of crude and refined oils on oysters were investigated to assist in developing precise water quality standards compatible with industry needs as well as the survival of oyster beds in the Delaware estuary. Tested were Iranian light crude, Nigerian crude, and No. 2 fuel oil, at oil concentrations varying from 0.05 to 0.8 ppm. Threshold levels for significant adult mortality were about 0.1 ppm for fuel oil, 0.3 ppm for Nigerian crude, and higher for Iranian crude. Larval stages of oysters tested were no more sensitive to toxic effects than were adult stages.

[from Dissertation Abstracts International B 39(11):5277-5278. 1979]

80A-0362

DISAPPEARANCE OF AROMATIC HYDROCARBONS AND ORGANIC SULPHUR COMPOUNDS FROM
FISH FLESH REARED IN CRUDE OIL SUSPENSION

Ogata, M. and Y. Miyake. 1979.

Water Research 13(1):75-78.

Uptake, Depuration, Concentrations, Aromatic hydrocarbons, Fish, Crude oil,
*Organic sulfur compounds

Eels were reared in seawater containing a crude oil suspension (Arabian Light and Zubair Crude, 4:1 at 50 ppm for 10 days), then transferred to clean seawater. The disappearance of aromatic hydrocarbons from the eel flesh was examined. After 10 days, the concentration ratio (eel flesh/water) of benzene, toluene, m- or p-xylene and o-xylene was 3:5, 13:2, 23:6 and 21:4 respectively. All hydrocarbons disappeared after the transfer into clean seawater, and the half-lives during the 1st phase (0-5 days) was 0.5, 1.4, 2.6 and 2.0 days. Aromatic hydrocarbons could serve as oil-pollution markers in fish.

80A-0363

EAGLES AND OIL DON'T MIX

Owen, R. 1979.

Conservation News 44(20):6-10.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

Refineries, Fisheries, Marine mammals, Birds, Maine

Eastport, Maine, is the site of a 1973 proposed oil refinery. The EPA was concerned about the effects on bald eagles and whales, especially during an oil spill. Non-renewable marine fishery resources were also considered. Marine mammals, such as whales, seals and dolphins would be even more endangered, since they feed near the ocean's surface. Bald Eagles may not survive an oil spill because of embryonic mortality, reduced food fish populations, and contamination of other prey. Measures will be taken to reduce impacts on eagles through education and counteraction.

80A-0364

ACCUMULATION AND METABOLISM OF PHENANTHRENE BY SAITHE-(*Pollachius virens*)
Palmork, K.H., J.E. Solbakken, and T. Neppelberg. 1978.

International Committee for Exploration of the Sea, ICES C.M. Pap. Rep.,
No. C.M. 1978/E:42. 14 p.

Uptake, Metabolism, Hydrocarbons, Fish, *Saithe, *Phenanthrene

Summary not available.

[from Marine Pollution Research Titles 6(7): #1249. 1979]

80A-0365

EFFECTS OF PETROLEUM HYDROCARBONS ON HEPATIC FUNCTION IN THE DUCK

Patton, J.F. and M.P. Dieter. 1980.

Comparative Biochemistry and Physiology, 65C(1):33-36.

Sublethal effects, Hydrocarbons, Birds, *Mallard ducks, *Hepatic function

In a series of tests involving mallard ducks and their chronic ingestion (7 months) of representative paraffinic or aromatic petroleum hydrocarbons, no mortality or visible symptoms of toxicity occurred. The aromatic hydrocarbons did produce a greater hepatic stress response than did the paraffinic hydrocarbons, but the adult ducks were able to tolerate high concentrations of these hydrocarbons for extended periods of time.

80A-0366

PESTICIDE AND XENOBIOTIC METABOLISM IN AQUATIC ORGANISMS (FURTHER STUDIES
ON THE EFFECT OF PETROLEUM HYDROCARBONS ON MIXED-FUNCTION OXIDASES IN
MARINE ORGANISMS)

Payne, J.F. and N. May. 1979.

American Chemical Society Symposium Series, No. 99:339-348.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

Metabolism, Aromatic hydrocarbons, Invertebrates, Fish, Mollusks, Crustaceans

Various marine invertebrates were exposed to high concentrations of oil in attempts to induce aromatic hydrocarbon hydroxylases in them. AHH activity was not induced in invertebrate digestive gland tissues or in hepatopancreatic tissues of lobsters. It was determined that neither fresh or saltwater bivalves can metabolize petroleum. Enzyme activity was induced in some fish tissue.

[from Environment Abstracts 9(9)#79-05211. 1979]

80A-0367

MACROBENTHIC SUCCESSION IN RELATION TO ORGANIC ENRICHMENT AND POLLUTION OF THE MARINE ENVIRONMENT

Pearson, T.H. and R. Rosenberg. 1978.

Oceanography and Marine Biology, Annual Review Vol.16:229-311.

Industries, Wastewaters, Contamination, Benthos, Marine environment

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:53, #3961. 1979]

80A-0368

EFFECTS OF CRUDE OIL ON ARCTIC MARINE INVERTEBRATES

Percy, J.A. 1977.

A Series of Four Reports on the Marine Ecology of the MacKenzie Delta and Tuktoyaktuk Peninsula Region. Arctic Marine Biological Station, 1977.

Ste. Anne de Bellevue, Quebec, Arctic Biological Station, 1977. p 31-99.

Crude oil, Invertebrates, Marine organisms, Arctic, Canada

Summary not available. [See also related entry by Arctic Biological Station in this issue, OPA.]

[from Marine Pollution Research Titles 5(7): #1236. 1978]

80A-0369

EFFECTS OF OIL ON ARCTIC MARINE ORGANISMS: A REVIEW OF STUDIES CONDUCTED BY THE ARCTIC BIOLOGICAL STATION

Percy, J.A. 1977.

International Committee for Exploration of the Sea, C.M. Pap. Report No. C.M. 1977/E:26. 24 p.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

Marine organisms, Biological effects, Arctic, Crude oil

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:60, #4026. 1979]

80A-0370

THE EKOFISK BRAVO BLOWOUT: PHYTOPLANKTON AND PRIMARY PRODUCTION INVESTIGATIONS

Rey, F., K. Seglem, and M. Johannessen. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap. Rep., Report No. C.M. 1977/E:55. p. 8:1-8:18.

Ekofisk blowout, North Sea, Phytoplankton, Production, *Research review

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:33, #3773. 1979]

80A-0371

FULL IMPACT OF CAMPECHE SPILL REMAINS UNKNOWN

Reynolds, P. 1979.

National Fisherman 60(8):12.

Ixtoc I blowout, Gulf of Mexico, Biological effects, Birds, Invertebrates, Marine organisms

South Texas shrimp fishermen are worried about the long-term effects of the Ixtoc I oil spill of 1979 in the Gulf of Mexico. Scientists are conducting extensive surveys to determine the effect of the spill on shrimp and other invertebrates, as well as on birds, mammals, and plant life.

80A-0372

DANISH MARINE OIL POLLUTION POLICY

Riisgard, H.U. 1979.

Marine Pollution Bulletin 10(9):250-52.

Biological effects, Marine environment, Denmark, Legislation

This article reviews the main points and conclusions of a report published by NAEP, on the biological effects of oil pollution in the marine environment. The report forms the basis of Danish marine oil pollution policy.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0373

LABORATORY EXPERIMENTS ON THE EFFECTS OF CRUDE OIL ON THE RED SEA
CORAL STYLOPHORA PISTILLATA

Rinkevich, B. and Y. Loya. 1979.

Marine Pollution Bulletin 10(11):328-330.

Biological effects, Crude oil, Reproduction, *Corals, *Stylophora
pistillata

"Sub-lethal detrimental effects of Iranian crude oil were studied on
the title subject in a long term laboratory experiment. It is con-
cluded that chronic oil pollution damages the reproductive system of
scleractinian corals."

80A-0374

THE EFFECTS OF WATER SOLUBLE PETROLEUM HYDROCARBONS ON VARIOUS CULTURES
AXENIC ALGAE

Roschke, S.C. 1979.

Fordham University, Bronx, New York, PhD Dissertation. 145 p.

WSF, Hydrocarbons, Concentrations, Bioassay, Phytoplankton, Algae

Effects of varying concentrations of four pollutant hydrocarbons on
the growth of axenic cultures of algae were determined. Outlined is
a bioassay procedure that can be applied to evaluate the relative
effects of water-soluble petroleum hydrocarbons on marine phytoplankton.

[from Dissertation Abstracts International B 40(2):658-659. 1979]

80A-0375

MARINE OIL POLLUTION AND BIRDS

Royal Society for the Protection of Birds (RSPB). 1980?

Bedfordshire, UK, RSPB, 1980? -p.

Birds, Toxicity, Mortality, UK

Summary not available. [Report is available from the Royal Society for
the Protection of Birds, Conservation Planning Department, The Lodge,
Sandy, Bedfordshire, SG19 2DL, UK.]

[from Spill Technology Newsletter 5(1):4. 1980]

80A-0376

EVOLUTION OF THE BIOMASS AND PHYSIOLOGY OF ZOOPLANKTON ON THE NORTH
COAST OF BRITTANY IN RELATION TO THE GROUNDING OF THE AMOCO CADIZ:
PRELIMINARY RESULTS FOR THE PERIOD FROM 16 MARCH TO 20 MAY 1978

[in French]

Samain, J.F., J. Le Fevre, J. Moal, J.Y. Daniel, and J. Boucher. 1978.
Actes des Colloques du Centre National pour l'Exploitation des Oceans,
No. 6:193-208.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

Biomass, Biological effects, Zooplankton, Coastal waters, France,
Amoco Cadiz spill

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S.
Moulder and A. Varley. Plymouth, UK, Marine Pollution Information
Centre, 1979. Supplement 3:31, #3748. 1979]

80A-0377

CHANGES IN SOME LIPID METABOLISM INDEXES IN WINTERING CARP UNDER THE
EFFECT OF DISSOLVED PETROLEUM PRODUCTS [in Russian]

Sergeeva, N.T., N.V. Dorina, S.I. Uvarova, N.P. Katasonova, and V.P.
Gumennikov. 1979.

Trudy Kaliningr. Tekhn. In-t Ryb. Prom-sti i Kh-v, No.83:38-45.

Metabolism, Fish, WSF, Petroleum products, *Carp, *Lipids

Summary not available.

[from Chemical Abstracts 91(21):169 460q. 1979]

80A-0378

EFFECTS OF CRUDE OIL ON DENITRIFICATION AND NITROGEN FIXATION IN
ARCTIC TUNDRA SOILS

Sexstone, A.J. and R.M. Atlas. 1978.

American Society for Microbiology, 78th Annual Meeting, Las Vegas,
Nevada, 1978. R. Slepecky (ed.). Washington, DC, American Society
for Microbiology, 1978. Abstract No. Q 72. p. 207.

Crude oil, Biological effects, Soil, Microorganisms, Arctic, *Deni-
trification, *Nitrogen fixation

"The effects of Prudhoe crude oil on denitrification, measured by
the acetylene blockage of N_2O reduction method, and nitrogen fixation,
measured by the acetylene reduction method, were examined in five
types of tundra soils exposed to oil in situ for periods of up to 7
years." Among the results were that initial rates of nitrogen fixa-
tion were depressed more than 50% both in basin soils exposed to oil
for 1 year and meadow soils exposed to oil for 7 years.

80A-0379

PHYSIOLOGICAL BASIS OF DIFFERENTIAL SENSITIVITY OF FISH EMBRYONIC
STAGES TO OIL POLLUTION

Sharp, J.R., K.W. Fucik, and J.M. Neff. 1979.

Marine Pollution: Functional Responses. W.B. Vernberg, A. Calabrese,
F.P. Thurberg, and J.F. Vernberg (eds.). New York, Academic Press,
1979. Proceedings of the Symposium: Pollution and Physiology of Marine
Organisms. p. 85-108.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

WSF, Hydrocarbons, Fish, Mortality, Growth, Development, *Fundulus heteroclitus

The mean lethal concentration for embryo larval stages of Fundulus heteroclitus was 1.5 ppm total hydrocarbons, of which 0.4 ppm were naphthalenes. Exposure to WSFs of hydrocarbons for 8 days after fertilization resulted in 40% decrease in hatching success. Newly hatched larvae were slightly less sensitive to similar concentrations of WSFs.

[from Chemical Abstracts 91(23): #187,483d. 1979]

80A-0380

COMPARISON OF THE USEFULNESS OF THE MEXICAN AXOLOTL (AMBYSTOMA MEXICANUM) AND THE CLAWED TOAD (XENOPUS LAEVIS) IN TOXICOLOGICAL BIOASSAYS

Slooff, W. and R. Baerselman. 1980.

Bulletin of Environmental Contamination and Toxicology 24(3):439-443.

Bioassay, Toxicity, Vertebrates, Chronic effects, *Amphibians

The title study bioassays include the test compounds benzene and o-Cresol, both petroleum products. The results are tabulated and discussed.

80A-0381

ACUTE EFFECTS - PACIFIC HERRING ROE IN THE GULF OF ALASKA

Smith, R.L. and J.A. Cameron. 1977.

Assessment of the Alaskan Continental Shelf. Vol 12. Effects. NOAA Outer Continental Shelf Environmental Assessment Program, 1977. p. 596-635.

Acute effects, Fish, Gulf of Alaska, *Pacific herring roe

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:45, #3888. 1979]

80A-0382

EFFECT OF WATER SOLUBLE FRACTION OF PRUDHOE BAY CRUDE OIL ON EMBRYONIC DEVELOPMENT IN PACIFIC HERRINGS

Smith, R.L. and J.A. Cameron. 1979.

Transactions of the American Fisheries Society 108(1):70-75.

WSF, Concentrations, Crude oil, Development, Growth, Fish, *Pacific herring, *Embryos

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
1. Biological Aspects

As WSF concentrations of 1 mg/g water, 6-day exposure to the Pacific herring (Clupea harengus pallasii) resulted in total mortality. Sublethal effects included malformed mouths in the embryos and exposure for 12 hours or longer led to reduced size of newly hatched larvae, suggesting adversely affected embryonic metabolism.

80A-0383

ACCUMULATION AND METABOLISM OF PHENANTHRENE IN RAINBOW TROUT

Solbakken, J.E. and K.H. Palmork. 1979.

ICES C.M. Paper, Report 1979/E51. 9p.

Uptake, Metabolism, Aromatic hydrocarbons, Fish, *Rainbow trout, *Phenanthrene
Summary not available.

[from Marine Pollution Research Titles 7(2): #324. 1980]

80A-0384

DISTRIBUTION OF RADIOACTIVITY IN COALFISH (POLLACHIUS VIRENS) FOLLOWING INTRAGASTRIC ADMINISTRATION OF [9-¹⁴C] PHENANTHRENE

Solbakken, J.E., K.H. Palmork, T. Neppelberg, and R.R. Scheline. 1979.

Bulletin of Environmental Contamination and Toxicology 23(1/2):100-103.

Uptake, Depuration, PAH, Crude oil, Fish, *Coalfish, *Phenanthrene

The coalfish (P. virens) was studied to obtain a better understanding of the uptake and excretion of polycyclic aromatic hydrocarbons (PAHs). Phenanthrene was selected as the representative compound because of its high abundance in crude oil. The amount of radioactive phenanthrene present after various times in the liver, gall bladder, and muscle was recorded and compared with similar studies.

80A-0385

IMPACT OF HOT CRUDE OIL SPILLS ON MICROORGANISMS IN A TAIGA SOIL IN ALASKA

Sparrow, E.B., C.V. Davenport, and R.C. Gordon. 1978.

American Society for Microbiology, 78th Annual Meeting, Las Vegas, Nevada, 1978. R. Slepecky (ed.). Washington, DC, American Society for Microbiology, 1978. Abstract No. Q 75. p. 207.

Crude oil, Biological effects, Bacteria, Fungi, Soil, Alaska, *Hot oil, *Taiga soil

Crude oil heated to 57°-60° was applied to separate test plots in winter and summer to determine the impact of hot oil on microbial populations and respiration. Filamentous fungal counts were strongly depressed by the addition of oil, but recovered in the summer test plots after 2 1/2 months. "In both oiled plots, yeasts, along with denitrifying proteolytic, oil utilizing, and cellulolytic microorganisms were favorably affected by oil addition...[and] soil respiration was also enhanced in the oiled plots."

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0386

THE BENTHIC COMMUNITY OF A NATURAL OIL SEEP IN THE SANTA BARBARA CHANNEL

Spies, R.B., P.H. Davis, and T.M. Distler. 1977.
Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems. C. Hall and W. Preston (eds.). Report EPA/600/7-77/111. p. 19-34.

Benthos, Natural seepage, Biological effects, Distribution, Marine organisms, Microorganisms, Santa Barbara Channel

A conclusion of this study is that the seep area supports an enriched community of organisms. It is hypothesized that "the constant presence of fresh crude oil in the sediments is responsible for the enriching effect." Work in progress and future research is detailed.

80A-0387

EFFECTS ON HATCHING IN LITTORINA LITTOREA AFTER AN OIL SPILL

Staveland, J.T. 1979.

Marine Pollution Bulletin 10(9):255-258.

Contamination, Crude oil, Norway, Reproduction, *Gastropods, *Littorina littorea

One year after a spill of approximately 2000 tons of Iranian crude oil on the west coast of Norway, specimens of the title organism were collected from the polluted shore and allowed to spawn in the laboratory. The oil contamination seemed to have no detectable effects on fertilization; however, the hatching success was significantly less in the "oil polluted" population.

80A-0388

SENSITIVITY OF SOME BROWN ALGAL REPRODUCTIVE STAGES TO OIL POLLUTION

Steele, R.L. and M.D. Hanisak. 1977.

International Seaweed Symposium, 9th, Santa Barbara, California, 20-27 August 1977. p. 181-191.

Toxicity, Concentrations, Reproduction, Algae

The bioassay potential of brown algae was assessed by studying the effects of oil on the reproductive stages of Fucus edentatus and Laminaria saccharina. Fertilization of F. edentatus was blocked by oil concentrations as low as 2 ppb. Oil concentrations above 20 ppb prevented L. saccharina spores from generating. Males of both species of algae were less tolerant to oil than females.

[from Environmental Abstracts 9(9): #79-05224. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0389

SUBLETHAL EFFECTS OF PETROLEUM ON MACOMA BALTHICA

Stekoll, M.S., L.E. Clements, and D.G. Shaw. 1977.

Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems. C. Hall and W. Preston (eds.). Report EPA/600/7-77/111. p. 1-17.

Sublethal effects, Crude oil, Dispersion, Uptake, Mollusks, *Macoma balthica

This paper reports the results of an experiment on the ability of M. balthica to concentrate oil from an oil-water dispersion, and effects of the oil on membrane-bound enzymes and other physical and chemical parameters of the clam. The oiling treatment appeared to have no deleterious effects on the clam, nor were there measurable differences in enzyme activity or other measured parameters between the oiled and nonoiled control groups.

80A-0390

ECOLOGICAL AND PHYSIOLOGICAL/TOXICOLOGICAL EFFECTS OF PETROLEUM ON AQUATIC BIRDS - A SUMMARY OF RESEARCH ACTIVITIES FY76 THROUGH FY78

Stickel, L.F. and M.P. Dieter. 1979.

US Fish and Wildlife Service Report FWS/OBS-79/23. 14 p.

Birds, Toxicity, Hydrocarbons, Growth, Development, Uptake, Analytical techniques, *Release, *Research review

Research projects summarized in this report assessed the following: effects of oiling on hatchability of eggs; effects of oil ingestion on physiological condition, survival, and reproduction of birds; accumulation and loss of oil by birds; and development of analytical methods for identification and quantification of oil breakdown products in tissues and eggs of ducks. Over 40 published and unpublished reports resulting from the research are cited in the appendices.

80A-0391

EXPERIMENTS WITH LITTORINA SPECIES TO DETERMINE THE RELEVANCY OF OIL SPILL DATA FROM SOUTHERN CALIFORNIA TO THE GULF OF ALASKA

Straughan, D. and D. Hadley. 1978.

Marine Environmental Research 1(7):135-163.

Petroleum products, Mollusks, Mortality, Toxicity, California, Pacific coast, Gulf of Alaska

In the title experiments, gasoline was the most toxic of all petroleum products tested. Temperature differences in some cases had a greater influence on survival and organism attachment rates than did petroleum types. It was also found that attachment rates and mortality rates changed after the animals were removed from petroleum. "This suggests a weakness in standard toxicity testing procedures when mortality rates are compared immediately after removal from test solutions."

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

80A-0392

EFFECTS OF BUNKER C OIL ON LIMULUS POLYPHEMUS JUVENILES

Strobel, C.J. 1978.

Masters Abstracts 17(2):112.

Crustaceans, Fuel oil, Toxicity, Behavior, *Limulus polyphemus,
*Molting

Newly hatched horseshoe crabs Limulus polyphemus were exposed to autoclaved Bunker C oil for 8 weeks. The minimum lethal dose was shown to be 2.25 mg/l and concentrations of 0.25 mg/l and greater caused a delay in molting. Floating behavior was affected by a concentration of 0.5 mg/l or greater and feeding by 1.0 mg/l or greater.

[from Petroleum Abstracts 20(7): #273,029. 1980]

80A-0393

MICROORGANISMS AS BIOLOGICAL INDICATORS OF COMMERCIAL-DOMESTIC AND PETROLEUM POLLUTION

Tokin, I.B., O.N. Trunova, and T.I. Izgoreva. 1978.

First American-Soviet Symposium on the Biological Effects of Pollution on Marine Organisms. T.W. Duke and A.I. Simonov (eds.). Gulf Breeze, Florida, US Environmental Protection Agency, Office of Research and Development, 1978. Report EPA-600/9-78-007, NTIS Report PB-285923. p. 107-111.

Microorganisms, Contamination, Biodegradation, Bioindicators, Barents Sea, Arctic

Objectives of the title study were "to explain the degree of pollution of two bays of the Barents Sea by commercial-domestic and petroleum pollutants according to the titer of microbiological indicators - coliform bacteria, enterococci, the petroleum oxidizing microorganisms and bacteriophages." It is concluded that "the titer of petroleum oxidizing microorganisms in the aqueous environment can serve as a criterion of pollution of the studied aquatorium from petroleum pollutants."

80A-0394

FUNDAMENTAL STUDIES ON THE INFLUENCE OF OIL POLLUTION UPON MARINE ORGANISMS - IV. THE TOXICITY OF MIXTURES OF OIL PRODUCTS AND OIL-SPILL EMULSIFIERS TO PHYTOPLANKTON [English summary]

Tokuda, H. 1979.

Bulletin of the Japanese Society of Scientific Fisheries 45(10):1289-1293.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

Toxicity, Petroleum products, Dispersants, Phytoplankton, Growth,
*Diatoms, *Emulsifiers

"The toxicity of mixtures of several oil products and oil spill emulsifiers to the growth of a marine diatom Skeletonema costatum was compared with that of individual oil products and oil spill emulsifiers. It was found that the toxicity of all mixtures tested is far higher than that of individual oil spill emulsifiers, but is similar to or slightly higher than that of the corresponding individual oil products."

80A-0395

THE LITTLENECK CLAM, PROTOTHACA STAMINEA, AS A TOOL FOR POTENTIAL OIL POLLUTION ASSESSMENT: PART I. DENSITY OF STOCK

Vanderhorst, J.R. and P. Wilkinson. 1979.

Marine Environmental Research 2(3):223-238.

Mollusks, Bioindicators, Economics, Fisheries, *Littleneck clams

"To determine quantitatively the effects of density change on the costs of economically important food populations, a population of Littleneck clams Protothaca staminea was studied. Costs (in terms of number of clams and hours of effort) of detecting changes in density are estimated."

[from Environmental Abstracts 9(10): #79-05944. 1979]

80A-0396

ABSENCE OF MUTAGENICITY DUE TO CRUDE AND REFINED OILS IN THE ALGA CHLAMYDOMONAS REINHARDTII

Vandermeulen, J.H. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap. Report No. C.M. 1977/E:88. 5p.

Crude oil, Petroleum products, Mutagens, Toxicity, Algae, *Chlamydomonas reinhardtii

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:57, #3996. 1979]

80A-0397

INFLUENCE OF OIL ON SEDIMENT MICROBIAL ACTIVITY

Walker, J.D., R.P. Burchard, and J. Arlauskas. 1978.

American Society for Microbiology, 78th Annual Meeting, Las Vegas, Nevada, 1978. R. Slepecky (ed.). Washington, DC, American Society for Microbiology, 1978. Abstract No. N 11. p. 164.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

Biological effects, Sediments, Microorganisms, *Microbial activity

"Generation of $^{14}\text{CO}_2$ from ^{14}C -labeled acetate, glucose, glutamate glycollate, N-acetylglucosamine, palmitate, tripalmitin, and urea added to oil-free and oil-contaminated sediments was used to determine the influence of oil on sediment microbial activity." Results are detailed.

80A-0398

ASSESSMENT OF THE ACUTE AND SUB-LETHAL EFFECTS OF VARIOUS POLLUTANTS ON SELECTED MARINE ORGANISMS AND THE FATE OF PETROLEUM HYDROCARBONS IN AN ESTUARY SUBJECTED TO A REFINERY EFFLUENT

White, I.C. 1978.

Final Reports on Research Sponsored Under the First Environmental Research Programme. Luxembourg, Commission of the European Communities, 1978. Report EUR 5970. p. 382-385.

Acute effects, Sublethal effects, Marine organisms, Fate, Hydrocarbons, Estuaries, Refineries, Wastewaters

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:54, #3970. 1979]

80A-0399

TRANSPORT, RETENTION, AND EFFECTS OF THE WATER-SOLUBLE FRACTION OF COOK INLET CRUDE OIL IN EXPERIMENTAL FOOD CHAINS

Whipple, J.[A.] 1977.

Environmental Assessment of the Alaskan Continental Shelf. Vol. 12: 674-678.

WSF, Crude oil, Uptake, Metabolism, Food web, Biological effects, *Retention

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:42, #3859. 1979]

80A-0400

REPRODUCTIVE RESPONSES OF QUAIL TO BUNKER C OIL FRACTIONS

Wootton, T.A., C.R. Grau, T.E. Roudybush, M.E. Hahs, and K.V. Hirsch. 1979.

Archives of Environmental Contamination and Toxicology 8(4):457-464.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

1. Biological Aspects

Toxicity, Fuel oil, Birds, Reproduction, *Japanese quail

"Bunker C fuel oil was extracted with petroleum ether and the concentrated extract was given to breeding Japanese quail (Coturnix coturnix japonica). A dose of extract equivalent to 300 mg bunker C reduced both egg production and hatchability. Fractionation of the extract by absorption on Florisil and elution with petroleum ether followed by chloroform yielded fractions that were tested for toxicity. All the fractions had a pronounced effect upon production; however, only the chloroform eluates were found to affect hatchability of the eggs."

80A-0401

NEOPLASIA IN SOFT-SHELL CLAMS (MYA ARENARIA), COLLECTED FROM OIL-IMPACTED SITES

Yevich, P.P. and C.A. Barszcz. 1977.

Annals of the New York Academy of Sciences, Vol. 298:409-426.

Biological effects, Mollusks, Maine, Atlantic coast, *Oil spill sites, *Mya arenaria, *Neoplasms

Over the past 7 years, histopathologic examinations have been conducted on marine invertebrates collected from various oil spill sites along the US Atlantic coast. "Of the 18 species . . . examined from 11 oil spill sites, only soft-shell clams, Mya arenaria, collected from two oil spill sites, Long Cove, Searsport, and Harpswell Neck in Maine have consistently shown neoplasms."

[from Marine Pollution Research Titles 5(9): #1588. 1979]

2. Physical and Chemical Aspects

80A-0402

A NOVEL CHARGE-TRANSFER POLYMER FOR SEPARATING HYDROCARBON FRACTIONS OF CRUDE OILS

Bancroft, K.C.C., S.B. Kendall, M.M. Rhead. and G. Hentic. 1979.

Marine Pollution Bulletin 10(8):238-239.

Hydrocarbons, Crude oil, Oil-water separation, *Charge-transfer

"Hydrocarbon fractions in crude oil were separated by a new charge-transfer polymer in place of silver ions in Argentation TLC." The new polymer which replaced silver nitrate was readily prepared, cheap, did not discolor on exposure on exposure to light, and was re-useable.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

2. Physical and Chemical Aspects

80A-0403

DISTRIBUTION OF HYDROCARBONS AMONG OIL, WATER AND VAPOR PHASES DURING OIL DISPERSANT TOXICITY TESTS

Bobra, A., D. Mackay, and W.Y. Shiu. 1979.

Bulletin of Environmental Contamination and Toxicology 23(4/5):558-565.

Distribution, Dispersion, Hydrocarbons, Toxicity, Physical aspects

Addressed is the problem of calculating the distribution of specific hydrocarbons between the oil phase (slick or dispersed), the aqueous phase and the vapor phase during a toxicity test. In many cases, the exposure of the organisms to hydrocarbons depends on the relative volume of these three phases; thus, the calculations discussed in this paper are essential components of interpreting toxicity observations.

80A-0404

PRELIMINARY OBSERVATIONS ON POLLUTION OF THE SEA BED AND DISTURBANCE OF SUB-LITTORAL COMMUNITIES IN NORTHERN BRITTANY BY OIL FROM THE AMOCO CADIZ

Cabioch, L., J.-C. Dauvin, and F. Gentil. 1978.

Marine Pollution Bulletin 9(11):303-307.

Amoco Cadiz spill, Sedimentation, Intertidal zone, Benthos, Environmental effects, *Seabed penetration

This report documents the rapid penetration of a considerable amount of oil into the seabed. Seabed morphology, currents and sediments and the effect of pollution on benthic communities are discussed.

80A-0405

DEPOSITION OF TAR BALLS (OIL RESIDUE) ON BEACHES ALONG THE WEST COAST OF INDIA

Dhargalkar, V.K., T.W. Kureishy, and M.V. Bhandare. 1977.

Mahasagar, Vol. 10:103-108.

Tar, Beaches, India, Coasts, *Residual oils

Summary not available.

[from Marine Pollution Research Titles 5(11): #1899. 1978]

80A-0406

EFFECT OF COASTAL PROCESSES ON THE DISTRIBUTION AND PERSISTENCE OF OIL SPILLED BY THE AMOCO CADIZ - PRELIMINARY CONCLUSIONS

D'Ozouville, L., E.R. Gundlach, and M.O. Hayes. 1978.

Actes des Colloques du Centre National pour l'Exploitation des Oceans No. 6:69-96.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

2. Physical and Chemical Aspects

Distribution, Physical effects, Shorelines, Sedimentation, Coasts, Intertidal zone, France, Amoco Cadiz spill

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:29, #3728. 1979]

80A-0407

ADSORPTION OF SOLUBLE AROMATIC HYDROCARBONS ON GRANULAR ACTIVATED CARBON

El-Dib, M.A. and M.I. Badawy. 1979.
Wath Research 13(3):255-258.

Aromatic hydrocarbons, Adsorption, Wastewater treatment, *Activated carbon

The adsorption of benzene, toluene, o-xylene and ethylbenzene on granular carbon was studied, and was found to conform to the Freundlich equation. Breakthrough curves of the studied compounds tend to show the efficiency of granular carbon columns in the removal of such pollutants. (possibly oil pollution related)

80A-0408

A LABORATORY STUDY ON THE ADHESION OF CRUDE OIL TO BEACH SAND IN THE PRESENCE OF A DISPERSANT

Harris, G.W. and P.G. Wells. 1979.
Spill Technology Newsletter 4(5):293-298.

Dispersants, Beaches, Sediments, Crude oil, Adsorption, Contamination

"It is evident from this study and others that the addition of dispersant increases the penetration distance of oil into the sand, thus increasing the volume of contaminated sand and complicating any subsequent cleaning procedure."

80A-0409

COASTAL MORPHOLOGY AND SEDIMENTATION, LOWER COOK INLET, ALASKA, WITH EMPHASIS ON POTENTIAL OIL SPILL IMPACTS

Hayes, M.O., P.J. Brown, and J. Michel. 1978.
Columbia, University of South Carolina, Department of Geology, Coastal Research Division, Technical Report No.12-CRD. 107p.

Sedimentation, Coasts, Oil spills, Alaska, *Coastal morphology, *Potential spill impacts

Summary not available.

[from Marine Pollution Research Titles 6(10): #1822. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

2. Physical and Chemical Aspects

80A-0410

THE EKOFISK BRAVO BLOWOUT: OCCURRENCE AND DISTRIBUTION OF PARTICULATE OIL FOLLOWING THE BRAVO BLOWOUT

Heyerdahl, T., Jr. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap. Rep., Report No. C.M. 1977/E:55. p.5:1-5:10.

Ekofisk blowout, North Sea, Oil slicks, Behavior, Fate, Distribution
Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:32, #3762. 1979]

80A-0411

NOTES ON THE CONDITION IN SEPTEMBER 1978 OF SOME INTERTIDAL SANDS POLLUTED BY AMOCO CADIZ OIL

Holme, N.A. 1978.

Marine Pollution Bulletin 9(11):302.

Amoco Cadiz spill, Fate, Sedimentation, Sediments, Beaches, Intertidal zone, Shorelines, France

This article reports on a conspicuous feature of some beaches which had been heavily polluted by the title spill six months previously. The strong development of grey or black layers close to the surface in sands which would not normally be discolored at this depth is cited.

80A-0412

SORPTION OF HYDROPHOBIC POLLUTANTS ON NATURAL SEDIMENTS

Karickhoff, S.W., D.S. Brown, and T.A. Scott. 1979.

Water Research 13(3):241-248.

Absorption, Adsorption, Contamination, Freshwater, Sediments, Rivers, Lakes, Aromatic hydrocarbons

"The sorption of hydrophobic compounds (aromatic hydrocarbons and chlorinated hydrocarbons), spanning a concentration range in water solubility from 500 parts per trillion to 1800 parts per million on local (North Georgia) pond and river sediments was investigated." Emphasized was the sorption role of sediment particle size and organic matter content and on the correlation of sorption with sorbate aqueous solubility. [possibly oil pollution related]

[from Waste Materials Biodegradation Research Titles 6(4): #79/4-UU-3081, p. 91. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
2. Physical and Chemical Aspects

80A-0413

A FIELD STUDY OF THE PERMEABILITY OF MULTIYEAR ICE TO SEA WATER WITH IMPLICATIONS ON ITS PERMEABILITY TO OIL

Milne, A.R., R.H. Herlinveaux, and G. Wilton. 1977.

Canada Department of Fisheries and the Environment, Environmental Impact Control Directorate, Technology Development Report EPS-4-EC-77-11. 33p.

Ice, Arctic, Cold climates, Seawater, *Permeability

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:8, #3525. 1979]

80A-0414

MECHANICAL DISPERSAL OF OIL STRANDED IN THE LITTORAL ZONE

Owens, E.H. 1978.

Baton Rouge, Louisiana State University, Report AD-A058 187/6SL. 14p.

Physical effects, Intertidal zone, Beaches, Weathering, Dispersion, *Mechanical dispersal

A review is presented of the effects of mechanical energy on the weathering and dispersion of oil stranded in the littoral zone. Sources of mechanical energy include wind, waves, tides, water levels, and ice.

80A-0415

CONTRIBUTION TO THE STUDY OF THE IMPACT ON THE LA CORUNA (SPAIN) LITTORAL ZONE OF CRUDE OIL LEAKED IN THE MONTE URQUIOLA ACCIDENT
Palomo, C., J. Acosta, J.R. DeAndres, P. Herranz, J. Rey, et al. 1978.

Deep-Sea Research Oceanographic Literature Review 26(3B):155.

Beaches, Intertidal zone, Crude oil, Distribution, Sedimentation, Spain, Urquiola spill

Beach morphology, oceanographic and meteorological factors responsible for the distribution of oil spilled from the tanker Monte Urquiola were studied. A sedimentation model for oil distribution on the beaches was developed.

[from Petroleum Abstracts 20(15): #274,605. 1980]

80A-0416

CHEMICAL AND SIZE FRACTIONATION OF AQUEOUS PETROLEUM DISPERSIONS

Shaw, D.G. and S.K. Reidy. 1979.

Environmental Science and Technology 13(10):1259-1263.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
2. Physical and Chemical Aspects

Chemical effects, Physical effects, Dispersion, Emulsions

The mode of mixing of oil and water may influence the biological impact of an oil spill, since it is likely that aquatic organisms take up and store different chemical and size fractions of petroleum in different ways.

80A-0417

FLOW STRUCTURE OF AN UNDERWATER BLOWOUT

Thornton, D.E. 1979.

Oil Spill Scenario for the Labrador Sea. B.R. LeDrew and K.A. Gustajtis. Department of the Environment, Canada, Report EPS-3-EC-79-4. Chapter 10. p. 327-346.

Physical aspects, Blowouts, Seawater, Sea surface, Behavior, Movement, Fate

For effective oil spill response measures in the case of a subsea blow-out, it is necessary to understand the behavior and movement of oil as it emerges from the sea floor and rises through the water column. This paper characterizes the point of emergence - the jet region, the plume of rising and spreading oil, and the near surface region - the area of horizontal spreading and outward movement.

80A-0418

SEDIMENT PENETRATION OF AMOCO CADIZ OIL, POTENTIAL FOR FUTURE RELEASE AND TOXICITY

Vandermeulen, J.H., D.E. Buckley, E.M. Levy, B.F.N. Long, et al. 1978.

Marine Pollution Bulletin 9(11):292-293.

Amoco Cadiz spill, Behavior, Sedimentation, Sediments, Weathering, Toxicity

Preliminary estimates suggest that as much as 900 metric tons of Amoco Cadiz cargo was buried within sandy sediments and would re-enter the marine environment during the winter beach erosional phase. The acute toxicity of Amoco Cadiz oil was found to increase directly with weathering and may become more toxic than Bunker C oil.

80A-0419

SEDIMENT PENETRATION OF AMOCO CADIZ OIL, POTENTIAL FOR FUTURE RELEASE AND TOXICITY

Vandermeulen, J.H., D.E. Buckley, E.M. Levy, B.F.N. Long, et al. 1979.

Marine Pollution Bulletin 10(8):222-227.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

2. Physical and Chemical Aspects

Contamination, Shorelines, Toxicity, Weathering, Amoco Cadiz spill

"Observations of oiled sandy beaches suggest two mechanisms of beach contamination - general penetration and contamination of beach substrate by films of sheen oil and the burial of discrete layers of mousse." It is also concluded that toxicity is not an absolute property of oil but varies with weathering.

3. Social and Economic Aspects

80A-0420

ENERGY DEMAND AND ENVIRONMENTAL POLLUTION [in German]

Bonus, H. 1977.

NTIS Report PC A02/MF A01. 9p.

Economics, Environmental effects

Using oil as an example, "the relation between the cost for the national economy . . . and the development of energy saving and nonpolluting technologies is outlined. Special emphasis is placed on the superiority of the market economy over dirigistic measures when it comes to solving the environmental problems." [possibly oil pollution related]

[from Energy Research Abstracts 4(1):32. #270. 1979]

80A-0421

MITIGATING OIL SPILL DAMAGE - ECOLOGICALLY RESPONSIBLE CLEANUP TECHNIQUES

Cox, G.V. and E.B. Cowell. 1979.

American Fisheries Society/et al Mitigation Symposium, Fort Collins, Colorado, 16-20 July 1979. p. 115-121.

Socioeconomic effects, Spill cleanup, Contingency planning

A thorough understanding of political and social demands, as well as preplanning experience, are necessary for effective mitigation of ecological impacts of oil spills. The results of cleanup techniques are analyzed.

[from Environmental Abstracts 10(1): #80-00405. 1980]

80A-0422

ROLE OF PUBLIC AFFAIRS DURING AN OIL SPILL

Mattoon, J. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.). US Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report PB-282 375. p. 139-142.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

3. Social and Economic Aspects

Spill Response, Government agencies, *News media, *Information dissemination

Because oil spills have drawn greater attention to the efforts of the US Fish and Wildlife Service in spill response and wildlife conservation, it is essential that this and other federal agencies keep the public and the news media well informed with accurate and timely information, disseminated in a professional and coordinated manner. Such a response to public concern can be of immeasurable benefit to the entire oil spill response effort.

80A-0423

REDUCING PROBLEMS OF THE PUBLIC IN AN OIL SPILL: A CASE STUDY OF THE NEPCO 140 INCIDENT, THE ST. LAWRENCE RIVER, JUNE, 1976

Omohundro, J.T. 1978.

State University of New York Research Foundation, Final Report
AD-A007-363/2SL. 121p.

Socioeconomic effects, USCG, St. Lawrence River, Contingency planning, Spill response, *NEPCO 140 spill

"The report concludes that the area residents' planning for and response to a massive river pollution event needs improvement and that the Coast Guard's handling of public problems can also be improved. Recommendations are made which could be applicable to Coast Guard public relations and spill planning on the St. Lawrence River as well as other water bodies.

4. Environmental Response and Recovery

80A-0424

REHABILITATION OF OIL-INUNDATED AGRICULTURAL LAND: A CASE HISTORY

Dibble, J.T. and R. Bartha. 1979.

Soil Science 128(1):56-60.

Restoration, Soil, Onshore, Land farming, Reclamation, Oil spills, New Jersey

Because of a pipeline break, nearly 2 million L of kerosene inundated about 1.5 hectares of a New Jersey wheat field. Rehabilitation measures included liming, fertilization, and frequent tilling, and continuous monitoring for 2 years of residual hydrocarbons. After 1 year, seed germination and yield data showed near-normal production figures; after 2 years insignificant quantities of hydrocarbons remained. The oil type and nature of the soil aided in the rapid recovery of this field.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
4. Environmental Response and Recovery

80A-0425

A THREE-YEAR STUDY AT WINSOR COVE: SALT MARSH GRASSES AND #2 FUEL OIL
Hampson, G.R. and E.T. Moul. 1977.
Oceanus 20(4):25-30.

Fate, Fuel oil, Marshes, Estuaries, Recovery, Plants, Massachusetts

Previous investigations seem to confirm that marshes are able to recover rather quickly from a "single dose" of oil. However, at Winsor Cove in Massachusetts, tidal oscillations and wind direction resulted in frequent, repetitive applications of oil, even though there was only one spill. This caused the substrate of Winsor Cove marsh to become impregnated with oil, which was then released over an extended period of time, resulting in a continuous stress on plant regeneration.

5. Baseline and Environmental Impact Studies

80A-0426

RESEARCH TO DETERMINE THE ACCUMULATION OF ORGANIC CONSTITUENTS AND HEAVY METALS FROM PETROLEUM-IMPACTED SEDIMENTS BY MARINE DETRITIVORES OF THE ALASKAN OUTER CONTINENTAL SHELF

Anderson, J.W., J.M. Augenfeld, E.A. Crecelius, and R. Riley. 1978.
US National Oceanic and Atmospheric Administration, Environmental Assessment of the Alaskan Continental Shelf, Annual Report of Principal Investigators, March 1978. Vol. VII: p. 350-403.

Marine organisms, Hydrocarbons, Benthos, Uptake, Sediments, Alaska, OCS, Baseline studies

Summary not available.

[from Marine Pollution Research Titles 6(10): #1803. 1979]

80A-0427

RESEARCH TO DETERMINE THE ACCUMULATION OF ORGANIC CONSTITUENTS AND HEAVY METALS FROM PETROLEUM-IMPACTED SEDIMENTS BY MARINE DETRITIVORES OF THE ALASKAN OUTER CONTINENTAL SHELF

Anderson, J.W., J.M. Augenfeld, E.A. Crecelius, and R. Riley. 1978.
US National Oceanic and Atmospheric Administration, Environmental Assessment of the Alaskan Continental Shelf, Quarterly Reports of Principal Investigators, April-June 1978. p. 581-596.

Marine organisms, Hydrocarbons, Benthos, Uptake, Sediments, Alaska, OCS, Baseline studies

Summary not available.

[from Marine Pollution Research Titles 6(7): #1189. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
5. Baseline and Environmental Impact studies

80A-0428

RESEARCH TO DETERMINE THE ACCUMULATION OF ORGANIC CONSTITUENTS AND HEAVY METALS FROM PETROLEUM-IMPACTED SEDIMENTS BY MARINE DETRITIVORES OF THE ALASKAN OUTER CONTINENTAL SHELF

Anderson, J.W., J.M. Augenfeld, E.A. Crecelius, and R.G. Riley. 1979. US National Oceanic and Atmospheric Administration, Environmental Assessment of the Alaskan Continental Shelf. Quarterly Reports of Principal Investigators, October-December 1978. Vol. I:507-540.

Marine organisms, Hydrocarbons, Benthos, Uptake, Sediments, Alaska, OCS, Baseline studies

Summary not available.

[from Marine Pollution Research Titles 6(9): #1597. 1979]

80A-0429

ASSESSMENT OF POTENTIAL INTERACTIONS OF MICRO-ORGANISMS AND POLLUTANTS RESULTING FROM PETROLEUM DEVELOPMENT

Atlas, R.M. 1978.

US National Oceanic and Atmospheric Administration, Environmental Assessment of the Alaskan Continental Shelf, Quarterly Reports of Principal Investigators, April-June 1978. p. 40-49.

Microorganisms, Development, Environmental effects, Alaska, OCS, Baseline studies

Summary not available.

[from Marine Pollution Research Titles 6(7): #1272. 1979]

80A-0430

CHARACTERIZATION OF ORGANIC MATTER IN SEDIMENTS FROM LOWER COOK INLET

Brenner, S., I.R. Kaplan, M.I. Venkatesan, J. Bonilla, et al. 1978.

US National Oceanic and Atmospheric Administration, Environmental Assessment of the Alaskan Continental Shelf, Annual Report of Principal Investigators, March 1978. Vol. VIII:589-621.

Biomass, Benthos, Bioindicators, Sediments, OCS, Alaska, Baseline studies

Summary not available.

[from Marine Pollution Research Titles 6(10): #1807. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
5. Baseline and Environmental Impact Studies

80A-0431

DISTRIBUTION AND ABUNDANCE OF HETEROTROPHIC BACTERIA IN THE SOUTH
BEAUFORT SEA

Bunch, J.N. 1977.

A Series of Four Reports on the Marine Ecology of the Mackenzie Delta
and Tuktoyaktuk Peninsula Region. Ste. Anne de Bellevue, Quebec, Arctic
Biological Station, 1977. p. 175-195.

Distribution, Bacteria, Beaufort Sea, Arctic, Canada, Baseline studies
Summary not available. [see related entry by Arctic Biological Station
in this issue, OPA.]

[from Marine Pollution Research Titles 5(7): #1240. 1978]

80A-0432

THE MISSISSIPPI, ALABAMA, FLORIDA, OUTER CONTINENTAL SHELF BASELINE
ENVIRONMENTAL SURVEY MAFLA 1977/1978. VOL. 1-B

Dames and Moore. 1979.

US Bureau of Land Management, Report BLM/YM/ES-79/02. Executive Summary
Report. 27p.

Baseline studies, Mississippi, Alabama, Florida, OCS, *MAFLA survey
Summary not available.

[from Marine Pollution Research Titles 7(2): #289. 1980]

80A-0433

THE MISSISSIPPI, ALABAMA, FLORIDA, OUTER CONTINENTAL SHELF BASELINE
ENVIRONMENTAL SURVEY MAFLA 1977/1978. VOL. 1-A

Dames and Moore. 1979.

US Bureau of Land Management, Report BLM/YM/ES-79/02. 275p.

Baseline studies, Mississippi, Alabama, Florida, OCS, *MAFLA survey
Summary not available.

[from Marine Pollution Research Titles 7(2): #288. 1980]

80A-0434

THE TRANSPORT AND BEHAVIOR OF OIL SPILLED IN AND UNDER SEA ICE - TASK 1
Deslauriers, P. and L.A. Schultz. 1978.

US National Oceanic and Atmospheric Administration, Environmental
Assessment of the Alaskan Continental Shelf, Quarterly Reports of
Principal Investigators, April-June 1978. p. 780-782.

Behavior, Fate, Movement, Physical effects, Spreading, Ice, Baseline
studies, Cold climates, Alaska

Summary not available.

[from Marine Pollution Research Titles 6(7): #1209. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
5. Baseline and Environmental Impact Studies

80A-0435

TRANSPORT MECHANISMS AND HYDROCARBON ADSORPTION PROPERTIES OF
SUSPENDED MATTER IN LOWER COOK INLET

Feely, R.A. and G.J. Massoth. 1978.

US National Oceanic and Atmospheric Administration, Environmental
Assessment of the Alaskan Continental Shelf, Quarterly Reports of
Principal Investigators, April-June 1978. p. 164-169.

Hydrocarbons, Adsorption, OCS, Alaska, Physical effects, Fate,

*Suspended matter

Summary not available.

[from Marine Pollution Research Titles 6(7): #1214. 1979]

80A-0436

PREVALENCE OF OILED PLUMAGE OF TERNS AND SKIMMERS ON WESTERN LONG
ISLAND, NEW YORK: BASELINE DATA PRIOR TO PETROLEUM EXPLORATION

Gochfeld, M. 1979.

Environmental Pollution 20(2):123-128.

Birds, Beaches, Atlantic coast, Contamination, Baseline studies,
Offshore, Exploration

Observations at Long Island seabird colonies from 1969 to 1978 showed
a somewhat constant prevalence of oiling of less than 1% for adult
common terns and 2% for adult black skimmers. Oiling was usually light
and very few heavily oiled birds were seen along Long Island's beaches.
There is much more oiling of seabirds on the Pacific and Gulf coasts
of North America and in Europe than on the Atlantic coast of North
America. Large-scale oil exploitation will present more threats to the
species studied.

80A-0437

BASELINE STUDY OF THE MARINE ENVIRONMENT IN THE AREA OF THE MACKENZIE
DELTA

Grainger, E.H. 1977.

A Series of Four Reports on the Marine Ecology of the Mackenzie Delta
and Tuktoyaktuk Peninsula Region. Ste. Anne de Bellevue, Quebec, Arctic
Biological Station, 1977. p. 101-173.

Baseline studies, Arctic, Canada, Marine Environment

Summary not available. [see related entry by Arctic Biological Station
in this issue, OPA.]

[from Marine Pollution Research Titles 5(7): #1223. 1978]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
5. Baseline and Environmental Impact Studies

80A-0438

STUDY OF MICROBIAL ACTIVITY AND CRUDE OIL - MICROBIAL INTERACTIONS IN THE WATERS AND SEDIMENT OF COOK INLET AND THE BEAUFORT SEA
Griffiths, R.P. and R.Y. Morita. 1978.

US National Oceanic and Atmospheric Administration, Environmental Assessment of the Alaskan Continental Shelf, Quarterly Reports of Principal Investigators, April-June 1978. p. 204-250.

Biodegradation, Microorganisms, Sediments, Crude oil, OCS, Alaska, Beaufort Sea, Baseline studies

Summary not available.

[from Marine Pollution Research Titles 6(7): #1275. 1979]

80A-0439

ENVIRONMENTAL ASSESSMENT OF NORTHERN PUGET SOUND AND THE STRAIT OF JUAN DE FUCA

Harris, H. 1977.

Program Review Proceedings of Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems. C. Hall and W. Preston (eds.). Report EPA/600/7-77/111. p. 133-142.

Environmental effects, Development, Pacific Coast, Ecosystems, Baseline studies, Predictions

This paper presents an overview of an ongoing five-year environmental assessment program of the title region, funded by EPA and administered by NOAA. The research is directed towards four major objectives, which are to: 1) characterize the marine biota subject to potential oil pollution impacts; 2) determine the existing distribution and levels of petroleum pollution from oil transport and refining; 3) characterize principal processes and pathways by which petroleum moves through marine ecosystems; and 4) provide decisionmakers with environmental information and predictions of oil-related activities and effects upon the ecosystem.

80A-0440

THE EFFECTS OF OIL ON TEMPERATURE REGULATION IN SEA OTTERS

Kooyman, G. 1978.

US National Oceanic and Atmospheric Administration, Environmental Assessment of the Alaskan Continental Shelf, Quarterly Reports of Principal Investigators, April-June 1978. p. 66-69.

Biological effects, Marine mammals, Baseline studies, OCS, Alaska, *Sea otter

Summary not available.

[from Marine Pollution Research Titles 6(7): #1230. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
5. Baseline and Environmental Impact Studies

80A-0441

OIL POOLING UNDER SEA ICE

Kovacs, A. 1978.

US National Oceanic and Atmospheric Administration, Environmental Assessment of the Alaskan Continental Shelf, Quarterly Reports of Principal Investigators, April-June 1978. p. 773-776.

Baseline studies, Ice, Alaska, OCS, Behavior, Movement, *Oil Pooling
Summary not available.

[from Marine Pollution Research Titles 6(7): #1232. 1979]

80A-0442

SUBLETHAL EFFECTS OF PETROLEUM HYDROCARBONS AND TRACE METALS, INCLUDING BIOTRANSFORMATIONS, AS REFLECTED BY MORPHOLOGICAL, CHEMICAL, PHYSIOLOGICAL AND BEHAVIORAL INDICES

Malins, D.C., E.H. Gruger, H.O. Hodgins, N.L. Karrick, and D.D. Weber. 1978.

US National Oceanic and Atmospheric Administration, Environmental Assessment of the Alaskan Continental Shelf, April-June 1978. p. 82-99.

Baseline studies, Sublethal effects, Hydrocarbons, OCS, Alaska, *Trace metals, *Biotransformations

Summary not available.

[from Marine Pollution Research Titles 6(7): #1241. 1979]

80A-0443

PRELIMINARY OFFSHORE ENVIRONMENTAL STUDY, PHYSICAL ENVIRONMENTAL BASELINE STUDY WITH APPLICATION TO THE PREDICTION OF OILSPILL MOVEMENT AND OILSPILL COUNTERMEASURES TECHNIQUES FOR THE DRILLING OFF NEWFOUNDLAND AND LABRADOR. VOLUME 1

NORDCO, Ltd. 1977.

St. John's, Newfoundland, Provincial Department of Mines and Energy, 1977. 286p.

Baseline studies, Environmental effects, Spill response, Movement, Predictions, OCS, Drilling, Labrador Sea, Canada, *Newfoundland, *Trajectories

Summary not available.

[from Oil Spill Scenario for the Labrador Sea, Department of the Environment, Canada, Report EPS-3-EC-79-4. p. 15. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
5. Baseline and Environmental Impact Studies

80A-0444

PRELIMINARY OFFSHORE ENVIRONMENTAL STUDY. DESCRIPTION AND ENVIRONMENTAL IMPACT ANALYSIS OF BLOWOUTS FOR THE SHELF ZONE OF NEWFOUNDLAND AND LABRADOR. VOLUME I

Northland Associates, Ltd. 1977.

St. John's, Newfoundland, Provincial Department of Mines and Energy, 1977. 286p.

Baseline studies, Environmental effects, OCS, Drilling, Blowouts, Canada, Labrador Sea, *Newfoundland

Summary not available.

[from Oil Spill Scenario for the Labrador Sea, Department of the Environment, Canada, Report EPS-3-EC-79-4. p. 15. 1979]

80A-0445

PRELIMINARY OFFSHORE ENVIRONMENTAL STUDY. A PRELIMINARY BIOLOGICAL BASELINE DESCRIPTION AND ENVIRONMENTAL IMPACT ANALYSIS OF BLOWOUTS FOR THE SHELF ZONE OF NEWFOUNDLAND AND LABRADOR. VOLUME II

Northland Associates, Ltd. 1977.

St. John's, Newfoundland, Provincial Department of Mines and Energy, 1977. 286p.

Baseline studies, Environmental effects, Blowouts, OCS, Labrador Sea, Canada, *Biological descriptions

Summary not available.

[from Oil Spill Scenario for the Labrador Sea, Department of the Environment, Canada, Report EPS-3-EC-79-4. p. 300. 1979.]

80A-0446

RESOURCE UTILIZATION AND POTENTIAL IMPACT

Northland Associates, Ltd. 1979.

Oil Spill Scenario for the Labrador Sea. B.R. LeDrew and K.A. Gustajtis. Department of the Environment, Canada, Report EPS-3-EC-79-4. Chapter 8. p. 239-300.

Baseline studies, Biological effects, Fisheries, Resource management, Birds, Marine mammals, Fish, Labrador Sea

This paper reviews the principal biological resources of Labrador coastal waters and assesses the potential impacts of an oil spill on the various species, habitats and commercial fisheries resources of the area. Seasonal variations in potential spill impacts are considered. Resources considered include commercial fish, shore birds, pelagic and migratory birds, and marine mammals.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
5. Baseline and Environmental Impact Studies

80A-0447

ACUTE AND CHRONIC TOXICITY, UPTAKE AND DEPURATION AND SUBLETHAL METABOLIC RESPONSE OF ALASKAN MARINE ORGANISMS TO PETROLEUM HYDROCARBONS

Rice, S.D., J.F. Karinen, and S. Korn. 1978.

US National Oceanic and Atmospheric Administration, Environmental Assessment of the Alaskan Continental Shelf, Quarterly Reports of Principal Investigators, April-June 1978. p. 70-79.

Acute effects, Chronic effects, Toxicity, Uptake, Depuration, Metabolism, Marine organisms, Alaska, Hydrocarbons, Baseline studies

Summary not available.

[from Marine Pollution Research Titles 6(7): #1259. 1979]

80A-0448

FROM ENVIRONMENTAL BASELINE STUDIES TO MONITORING, RESEARCH, AND DESIGN

Ruskin, A.M. 1978.

Eleventh Oil Shale Symposium Proceedings. J.H. Gary (ed.). Golden, Colorado, Colorado School of Mines, 1978. p. 113-119.

Baseline studies, Monitoring, Environmental effects, Oil Shale, Development, *Colorado

Reviewed are environmental baseline studies performed at an Occidental Oil Shale, Inc. site near Grand Junction, Colorado. These studies were conducted to guide the environmentally acceptable development of a modified in-situ oil shale project, to provide a basis for any environmental changes that might occur from oil shale activities, and to develop data for permit applications.

80A-0449

PRE-IMPACT PROCESS ANALYSIS: DESIGN FOR MITIGATION

Truett, J.C. 1979.

American Fisheries Society/et al Mitigation Symposium, Fort Collins, Colorado, 16-20 July 1979. p. 355-361.

Fisheries, Wildlife, Coasts, Offshore, Development, Baseline studies, Alaska, Beaufort Sea

"A study of the physical and biological processes supporting important fish and wildlife species along Alaska's Beaufort Sea coast suggests ways for petroleum development to proceed with the least possible impact to fish and wildlife habitat."

[from Environment Abstracts 10(1): #80-00409. 1980]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

5. Baseline and Environmental Impact Studies

80A-0450

ENVIRONMENTAL ASSESSMENT OF THE ALASKAN CONTINENTAL SHELF. PRINCIPAL INVESTIGATORS' ANNUAL REPORT, MARCH 1978. VOL. VIII. CONTAMINANT BASELINES

US National Oceanic and Atmospheric Administration. 1978.

NOAA Outer Continental Shelf Environmental Assessment Program. 621p.

OCS, Development, Contamination, Alaska, Environmental effects, Baseline studies

Summary not available.

[from Marine Pollution Research Titles 6(10): #1856. 1979]

6. Legal and Regulatory Aspects

80A-0451

AGREEMENT REACHED AT KUWAIT CONFERENCE [news brief]

Anon. 1978.

Environmental Policy and Law 4(2/3):81.

International conventions, Pollution prevention, UN, Kuwait, *Middle East

Bahrain, Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates have agreed on two UN-sponsored environmental protection treaties. The first is a framework convention, which in its preamble recognizes the pollution of the marine environment of the region by oil and other substances; the second is a protocol calling for cooperation in combatting oil and other pollution in cases of emergency.

80A-0452

EEC ATTACKS MARINE POLLUTION CONVENTIONS [news brief]

Burke, T. 1979.

New Scientist 84(1179):332.

Regulations, International conventions, Amoco Cadiz spill, Europe, *EEC

A recent EEC meeting decided upon initiatives to strengthen port state jurisdiction in the North Sea area over violations of pollution regulations. The Amoco Cadiz disaster was mentioned as an example for the EEC to try to prevent similar accidents and deal with future oil spills.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
6. Legal and Regulatory Aspects

80A-0453

COMPENSATING STATES AND THE FEDERAL GOVERNMENT FOR DAMAGES TO NATURAL RESOURCES RESULTING FROM OIL SPILLS

Mattson, J.S. 1979.

Coastal Zone Management Journal 5(4):307-332.

Government agencies, State governments, Compensation, *Spill damages

The National Advisory Committee on Oceans and Atmosphere issued a report that suggests payment for damages to natural resources as part of clean-up costs. If the damages are to irreplaceable resources, compensation should be allowed for the reasonable cost of acquiring resources. The ecological effects of oil pollution are discussed in 5 areas, centering on the difficulty of using replacement cost as an indicator of environmental damage. The conclusion is that as a measure of damages, replacement cost may do little to compensate for long term ecological damage due to oil spills.

[from Petroleum Abstracts 20(7): #273,019. 1980]

80A-0454

TOWARD REGIONAL ARRANGEMENTS FOR REGULATION OF MARINE POLLUTION: AN APPRAISAL OF OPTIONS

Okidi, C.O. 1977.

Ocean Development and International Law Journal 4(1):1-25.

International agreements, Legislation, Pollution control, Marine environment, Coastal waters, Canada

Canada's unilateral decision in 1970 to extend its jurisdiction for the control of marine pollution of the Arctic waters outward to 100 miles was attacked as a violation of international law. This paper analyzes and appraises their model of unilateralism, a regulatory regime by a global agency, and a regional approach with some recommendations for an effective arrangement for the control of pollution in the high seas. [possibly oil pollution related]

[from Oceanic Abstracts 15(4): #78-05158. 1978]

80A-0455

SPILLING OIL MAY BE HAZARDOUS TO YOUR WEALTH

Puglisi, R.L. 1979.

Natural Resources Journal 19(3):735-752.

Oil discharges, Regulations, Legislation, US, Liability

Pursuant to the Federal Water Pollution Control Act Amendments of 1972, the federal government has comprehensive powers regarding the discharge of oil and other hazardous materials. In this article major penalty provisions of the amendment are discussed. The conclusion is that it

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

6. Legal and Regulatory Aspects

will be necessary for additional case law to develop before generalizations may be made as to the efficacy of the 1972 amendments.

[from Petroleum Abstracts 20(15): #274,608. 1980]

80A-0456

LIABILITY WITHOUT FAULT UNDER THE FEDERAL WATER POLLUTION CONTROL ACT
Valadez-Ferreira, B. 1979.

Natural Resources Journal 19(3):687-692.

Legislation, US, Liability, Law enforcement, USCG

The US Seventh Circuit Court of Appeals has enforced civil penalties, assessed by the US Coast Guard, against 2 discharging facilities for oil spills caused by third parties. This study reviews the decision with reference to the Federal Water Pollution Control Act and the events of the spill. Arguments of the discharging facilities are discussed and the conclusion is that punishing defendants who are concededly without fault appears to be a self-defeating exercise of power by the US Coast Guard.

[from Petroleum Abstracts 20(15): #274,601. 1980]

80A-0457

UNEP'S EXPERT MEETING ON LIABILITY AND COMPENSATION FOR POLLUTION DAMAGE
Willheim, E. 1977.

Environmental Policy and Law 3(3/4):109-113.

Liability, Compensation, Offshore, Development, Onshore, Sources, Rivers, Pollution control, UN, *UNEP convention

The title meeting [Nairobi, Kenya, 23 February-4 March 1977] was convened to assess liability and compensation for marine pollution from offshore mineral resources, including oil; for marine pollution from land based sources, and for pollution of air and rivers.

7. General Aspects

80A-0458

CONCAWE REPORT [book review]

Anon. 1979.

Marine Pollution Bulletin 10(8):217-218.

Spill cleanup, Spill disposal, Onshore, Pipelines, *OSCU

CONCAWE's annual report has been released, including information on its new advisory group - Oil Spill Clean-Up Technology (OSCU) which will study inshore and onshore cleanup and disposal techniques. The annual report also mentions other areas of study, including water effluent discharges containing specific dangerous compounds and oil pipeline spillages.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
7. General Aspects

80A-0459

THE INSIGNIFICANT EFFECTS OF EKOFISK ON FISH BREEDING GROUNDS
[in French]

Anon. 1978.

Petroleum Information, No. 1460:23.

Ekofisk blowout, North Sea, Environmental effects, Plankton, Fish

Although about 20,000 tons of oil escaped in the Bravo well blowout, an estimated 40% vaporized before reaching the sea surface. Extensive physical and biological studies of the spill area indicated no plankton destruction and therefore no consequent harm to the fish population.

[from The Biological Effects of Oil Spills. Report NTIS/PS-79/0584. p. 130. 1979]

80A-0460

THE WORST OIL SPILL

Anon. 1980.

OCS Update 5(1):1-3.

Ixtoc 1 blowout, Offshore, Gulf of Mexico, Environmental effects, Personnel training, Regulations

The series of events leading to the Ixtoc-1 well blowout, which began in June 1979 off Campeche, Mexico, is reviewed. Over 2 million bbl of oil have flowed out and heavy mortality is expected for marine life in Campeche Bay. It is not believed that a blowout such as this could occur in US waters because of better personnel training and tighter federal regulations.

80A-0461

POLLUTANT EFFECTS ON MARINE ORGANISMS [book review]

Addison, R.F. 1979.

Journal of The Fisheries Research Board of Canada 36(4):475.

Biological effects, Hydrocarbons, Marine organisms, Contamination, Book review

The title book [C.S. Giam (ed.). Lexington, Massachusetts, Lexington Books, D.C. Heath & Co., 1977. xi +213p.] is critically examined. The book summarizes the proceedings of a workshop held in May 1976, to discuss ongoing research and to identify research priorities in the effects of pollutants, including petroleum hydrocarbons, on marine biota.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

7. General Aspects

80A-0462

STUDY OF THE HYDROCARBON POLLUTION IN THE ABER BENOIT [in French]

Allen, G., L. D'Ozouville, and J. L'Yavane. 1978.

Actes des Colloques du Centre National pour l'Exploitation des Oceans, No. 6:97-114.

Contamination, Coasts, Estuaries, France, Amoco Cadiz spill

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:28, #3717. 1979]

80A-0463

A SERIES OF FOUR REPORTS ON THE MARINE ECOLOGY OF THE MACKENZIE DELTA AND TUKTOYAKTUK PENINSULA REGION

Arctic Biological Station. 1977.

Ste. Anne de Bellevue, Quebec, Arctic Biological Station, 1977. 195p.

Biodegradation, Biological effects, Crude oil, Microorganisms, Arctic, Canada, Beaufort Sea, Baseline studies

The four reports are entitled: Degradation of petroleum by a psychrotolerant marine flora from the Eskimo Lakes Northwest Territories (Bunch, J.N. and R.C. Harland); Effects of crude oil on Arctic marine invertebrates (Percy, J.A.); Baseline study of the marine environment in the area of the Mackenzie delta (Grainger, E.H.); and Distribution and abundance of heterotrophic bacteria in the South Beaufort Sea (Bunch, J.N.). [These reports are listed separately in this issue, OPA.]

[from Marine Pollution Research Titles 5(7): #1210. 1978]

80A-0464

EFFECTS OF OILFIELD BRINE EFFLUENT ON SEDIMENTS AND BENTHIC ORGANISMS IN TRINITY BAY, TEXAS

Armstrong, H.W., et al. 1979.

Marine Environmental Research 2(1):55-70.

Wastewaters, Oil fields, Sediments, Benthos, Marine organisms, Hydrocarbons, Concentrations, Texas, *Brine

Effects of brine effluent from a salt dome oil field on the benthic community surrounding the separator platform for the field were studied. The correlation between the abundance of organisms and petroleum hydrocarbon concentrations in the sediments was assessed through the analysis of the water and sediments for naphthalene concentrations. No organisms were in existence within 15m of the effluent outfall, but life forms over 455m from the platform were unaffected.

[from Environmental Abstracts 9(10): #79-05931. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

7. General Aspects

80A-0465

REGIONAL OCEANOGRAPHY AS IT RELATES TO PRESENT AND FUTURE POLLUTION PROBLEMS AND LIVING RESOURCES - CARIBBEAN

Atwood, D.K. 1978.

International IOC/FAO/UNEP Marine Pollution In the Caribbean & Adjacent Region Workshop Proceedings, No.11, Port-of-Spain, Trinidad, 13-18 December 1976. NOAA Atlantic Oceanographic & Meteorologic Laboratory Collected Reprints, 1978, Vol. 1:539-571.

Environmental effects, Oil spills, Caribbean Sea, Puerto Rico

This work provides a framework in which possible effects from pollution can be considered. Various types of pollution sources and the problems they present, including oil pollution, are discussed.

[from Petroleum Abstracts 19(40): #268,268. 1979]

80A-0466

MARINE ECOLOGY AND OIL POLLUTION

Baker, J.M. 1978.

Journal Water Pollution Control Federation 50(3):442-449.

Monitoring, Bioindicators, Marine environment, Environmental effects, Oil discharges, Industries, UK

Approaches used by the Oil Pollution Research Unit (Orielson Field Centre, Pembroke, Wales) to study marine oil pollution problems are outlined; field surveys, biological monitoring, and field experiments are emphasized. Results indicate that no generalizations can be made about biological damage resulting from oil pollution, because a great number of variables are involved in each situation. Increasing research emphasis is placed on the monitoring of new industrial developments, and some of the objectives, methods and difficulties of biological monitoring schemes are discussed.

80A-0467

EFFECTS OF THE POLLUTION RESULTING FROM THE GROUNDING OF THE AMOCO CADIZ. STUDY OF THE TRAWLING RESOURCES, MORLAIX AND LANNION BAYS

[in French]

Beillois, P., Y. Desauay, D. Dorel, and M. Lemoine. 1979.

France, Institut Scientifique et Technique des Pêches Maritimes, 1979. 35p.

Environmental effects, Economic effects, Fisheries, Coastal waters, France

Summary not available.

[from Marine Pollution Research Titles 6(9): #1599. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

7. General Aspects

80A-0468

ENVIRONMENTAL ASSESSMENT OF AN OFFSHORE OIL FIELD: A PROGRESS REPORT

Berry, R.J. and E.D. McRae. 1977.

Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems. C. Hall and W. Preston (eds.). Report EPA/600/7-77/111. p. 143-152.

Environmental effects, Offshore, Production, OCS, Platforms, Ecosystems, Habitats, Texas, *Buccaneer Oil Field

The Buccaneer Oil Field located south of Galveston was selected for study because it is isolated from other offshore production areas and has been in operation long enough to allow development of climax communities. This study compares ecosystems in the producing field with those in unaltered control areas and identifies changes attributable to pollutants and the presence of production platforms.

80A-0469

MOLECULAR BASIS OF ENVIRONMENTAL TOXICITY

Bhatnagar, R.S. 1980.

Ann Arbor, Michigan, Ann Arbor Science Publishers Inc., 1980. 589p.

Toxicity, PAH, Environmental effects, Carcinogens

This book covers most of the major classes of environmental toxins and deals with mechanisms involved in the induction of disease by specific toxins as well as groups of toxins. The section on molecular mechanisms in environmental carcinogenesis includes a discussion of the carcinogenic activity of polycyclic aromatic hydrocarbons. [possibly oil pollution related]

[from Ann Arbor Science Publishers Science Previews, Spring 1980. p.4.]

80A-0470

AQUATIC POLLUTANTS: TRANSFORMATION AND BIOLOGICAL EFFECTS [book review]

Biswas, A.K. 1979.

Endeavour 3(3):134.

Sources, Fate, Biodegradation, Analytical techniques, Aquatic environment, Contamination, Book review

The title book [O. Hutzinger, L.H. van Lelyveld, and B.C.J. Zoeteman (eds.). Oxford, UK, Pergamon Press, 1978. 519p.] is reviewed. The book contains 46 papers on a wide variety of topics. Papers by S.C. Brassell et al., R. Ferrand et al., D. Mackay, and A. Waggott et al. discuss petroleum pollutants. "The book is a useful addition to the expanding scientific literature on this important topic." [cited papers are abstracted separately in OPA 5(3).]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
7. General Aspects

80A-0471

THE IMPACT OF THE AMOCO CADIZ [journal review]

Bourne, W.R.P. 1979.

Marine Pollution Bulletin 10(8):216.

Environmental effects, Health hazards, Socioeconomic effects, Dispersants, *Penn ar Bed Journal

Two issues of the French journal Penn ar Bed dealing with the Amoco Cadiz spill have been published as NOS 93 and 94. The first number discusses the effects on the flora and fauna attributing the moderate damage of the spill to the turbulence of the local sea and limited use of toxic dispersants. Number 94 discusses potential impact on public health and the indignation of local fishermen.

80A-0472

POLLUTION OF THE SEA. ANNUAL REPORT. 1976.

British Advisory Committee on Oil Pollution of the Sea. 1977.

Report of the Advisory Committee on Oil Pollution of the Sea, 1977. 36p.

Oil spills, Marine environment, UK, *Annual report-1976

Summary not available.

[from Marine Pollution Research Titles 5(7): #1216. 1978]

80A-0473

REPORT OF THE ADVISORY COMMITTEE ON OIL POLLUTION OF THE SEA

British Advisory Committee on Oil Pollution of the Sea. 1978.

British Advisory Committee on Oil Pollution of the Sea, 1978. Annual Report. 37p.

Oil spills, Marine environment, UK, *Annual report-1977

Summary not available.

[from Marine Pollution Research Titles 5(7): #1217. 1978]

80A-0474

THE ECOLOGICAL IMPACT ON AND NEAR SHORES BY THE AMOCO CADIZ OIL SPILL
Chassé, C. 1978.

Marine Pollution Bulletin 9(11):298-301.

Amoco Cadiz spill, Marine organisms, Plants, Animals, Sediments, Coastal waters, Shorelines

After the Amoco Cadiz oil spill the Université de Bretagne Occidentale mobilized a team of students, faculty, and research staff to study the spill's effects on the flora and fauna of the polluted coast. By comparison with previous pollution accidents it is concluded that less

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

7. General Aspects

damage to the marine environment occurred than might have been expected. The most serious aspect has been the accumulation of petroleum hydrocarbons in sediments and their interstitial water.

80A-0475

OUTLINE OF A PROVISIONAL ECOLOGICAL BALANCE-SHEET OF THE IMPACT OF THE OIL SPILL FROM THE AMOCO CADIZ ON THE SHORE [in French]

Chassé, C. 1978.

Actes des Colloques du Centre National pour l'Exploitation des Oceans, No. 6:115-134.

Environmental effects, Shorelines, Coasts, France, Statistics, Amoco Cadiz spill

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:28, #3724. 1979]

80A-0476

GROUND-WATER POLLUTION - A LIMITED PROBLEM

Clark, D.T. 1979.

Ground Water 17(1):25-27.

Groundwater, Leakage, Oil spills, Water quality

This article contends that "as serious as some isolated ground-water pollution problems are, regionally and nationally, it is only a limited problem." Chemical and petroleum spills may affect groundwater areas measured in square miles, but these areas are surrounded by tens to hundreds of square miles where groundwater maintains its' good quality.

80A-0477

MARINE POLLUTION - FACTS AND FICTION, THE SITUATION IN BRITAIN

Cole, H.A. 1979.

Ocean Management 5(3):263-278.

UK, Fisheries, Biological effects, Estuaries

A general discussion of marine pollution, with oil pollution being one of the subjects briefly addressed, concludes that there is no evidence of severe reduction of offshore fish stock or shellfish yield and the impression that pollution has caused serious biological damage is not soundly based.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
7. General Aspects

80A-0478

AMOCO CADIZ: PRELIMINARY OBSERVATIONS OF THE OIL SPILL IMPACT ON THE MARINE ENVIRONMENT

Conan, G., L. D'Ozouville, and M. Marchand. 1978.
Paris, Centre National pour l'Exploitation des Oceans, 1978. Report N79-27726/5SL, NTIS Report HC A11/MF A01. 239p.

Amoco Cadiz spill, France, Coastal waters, Environmental effects

Summaries of 19 reports referring to the Amoco Cadiz incident, which are presented by various scientific teams working in the field, were given.

[from Scientific and Technical Aerospace Reports 17(18): #N79-27726. 1979]

80A-0479

EMISSIONS FROM IN SITU BURNING OF CRUDE OIL IN THE ARCTIC

Day, T., D. Mackay, S. Nadeau, and R. Thurier. 1979.
Water, Air, and Soil Pollution 11(2):139-152.

Oil spills, Burning, Arctic, Beaufort Sea, Pollution control, Oil removal

"Examined are the effects of in situ burning of spilled crude oil on air quality in the Beaufort Sea region of the Arctic Ocean. Presented is a scenario defining the amounts of oil released, the size and number of burnable oil pools, and the duration of the burning period. Expected emissions of soot, carbon monoxide, sulfur dioxide, and metals are estimated."

[from Environmental Abstracts 9(9): #79-04901. 1979]

80A-0480

FATE AND EFFECTS OF OIL IN THE SEA

Exxon Corporation. 1978.
New York, NY, Exxon Corporation, Public Affairs Department, 1978. 11p.

Crude oil, Marine environment, Biological effects, Fate, Behavior, Beaches, Coasts, Birds, Fish, Marine organisms, Health hazards

This publication briefly reviews the following topics: Sources and inputs of oil into the sea; fate of oil in the sea; and effects of oil in the sea. Specific effects discussed are food chain magnification, oiling and tarring of beaches and shorelines, effects on bird populations, effects on benthic communities, effects on fisheries, and effects on human health.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

7. General Aspects

80A-0481

AN OVERVIEW OF THE BIOGEOCHEMISTRY OF FOSSIL FUEL HYDROCARBONS IN THE MARINE ENVIRONMENT

Farrington, J.W. 1978.

American Chemical Society, Petroleum Chemical Division Preprints 23(3): 818-834.

Fate, Environmental effects, Chemical analysis, Guidelines, Hydrocarbons, Marine environment

The progress, since 1970, toward understanding sources, fates and effects of fossil fuel hydrocarbons in the environment is presented in a brief review within the context of the need for analytical chemistry in fate and effects studies. Also included are guidelines for interpretation of analyses and data by using examples from recent studies of the contemporary marine environment.

[from Petroleum Abstracts 19(47): #270,118. 1979]

80A-0482

RECENT ADVANCES IN ENVIRONMENTAL ANALYSIS

Frei, R.W. (ed.). 1979.

New York, Gordon and Breach Science Publishers, 1979. 359p.

Sampling, Source identification, Chemical analysis, Wastewaters, Oil-water separation, *Proceedings

Papers selected primarily from the 8th Annual Symposium on the Analytical Chemistry of Pollutants (Geneva, 1978) constitute this book; several of the papers are relevant to sampling, analysis and treatment of petroleum hydrocarbons in marine organisms, seawater, and sediments. Papers by J. Albaiges, et al., R.H. Bierl, et al., D.C. Malins, et al., and E.F. Smith, et al., are abstracted separately in this issue. [see author index].

80A-0483

THE AMOCO CADIZ SPILL - SPECIAL ISSUE OF MARINE POLLUTION BULLETIN. NOVEMBER 1978. VOLUME 9, No. 11 [book review]

Gaskell, T. 1979.

Endeavour 3(4):183.

Chronic effects, Amoco Cadiz spill, Environmental effects, Book review

"This special number of the Marine Pollution Bulletin, provides a well balanced interim report of the Amoco Cadiz oil spill. Although the wreck of this large tanker caused a horrible mess at the time of the accident, the biological and ecological reports show that there have been no long-term effects on the amenity values or the natural fauna and flora."

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
7. General Aspects

80A-0484

PROGRAM REVIEW PROCEEDINGS OF: ENVIRONMENTAL EFFECTS OF ENERGY RELATED ACTIVITIES ON MARINE/ESTUARINE ECOSYSTEMS

Hall, C. and W. Preston. 1977.

Report EPA/600/7-77/111, NTIS Report PB-284-296. 303p.

Biological effects, Contamination, offshore, Marine environment, Estuaries, Models, Environmental effects, *Proceedings

The title proceedings include 9 papers dealing with biological and environmental effects of oil pollution and offshore drilling and production activities, sampling and analysis of contaminants, and prediction of spill trajectories. Papers by J.W. Anderson, et al.; C.S. Barrientos; R.J. Berry, et al.; M.P. Dieter; H. Harris; N.L. Richards; R.B. Spies, et al.; M.S. Stekoll, et al.; and D.A. Wolfe are abstracted separately in this issue. [see author index]

80A-0485

VULNERABILITY OF COASTAL ENVIRONMENTS OF LOWER COOK INLET, ALASKA, TO OIL SPILL CONTACT

Hayes, M.O., J. Michel, and P.J. Brown. 1977.

4th International Conference on Port and Ocean Engineering under Arctic Conditions, St. John's, Newfoundland, 26 September 1977. St. John's, Newfoundland, Ocean Engineering Information Centre, 1977. Vol.2:832-843.

Environmental effects, Oil spills, Coastal waters, Shorelines, Bays, Alaska, *Vulnerability index

Summary not available.

[from Marine Pollution Research Titles 6(7): #1220. 1979]

80A-0486

A PERSPECTIVE OF ENVIRONMENTAL POLLUTION

Holdgate, M.W. 1979.

London, Cambridge University Press, 1979. x + 278p.

Hydrocarbons, Fate, Behavior, Pollution control, Cost analysis, Environmental effects

Among the topics covered are: The ecological context of pollution; a definition and classification of pollution and pollutants; pollutant pathways in water and air; effects and changes caused by pollutants; the monitoring, surveillance, cost analysis and control of pollution; the international scope of pollution; and future approaches to pollution control and environmental management. Pollution by petroleum hydrocarbons is considered throughout the text.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
7. General Aspects

80A-0487

OIL AND GROUND WATER - A POTENTIAL U.K. PROBLEM

Hunter-Blair, A. 1978.

Water, Journal of the National Water Council, UK, 22(1):15-16.

Groundwater, Exploration, Development, Contamination, Detection, Monitoring, UK, *Conference

At the international symposium "Ground Water Pollution by Oil Hydrocarbons" held in Prague in 1978, the main emphasis was geared toward specific problems of groundwater pollution and protection. The program was divided into 4 sessions: (1) methods of hydrogeological exploration and decontamination of rock and ground water; (2) movement of oil in ground water and rocks; (3) chemical relations in the interaction system; and (4) location and areal measurement of contamination by surface methods.

[from Petroleum Abstracts 20(12): #274,050. 1980]

80A-0488

NEW YORK'S MARINE FISHERIES: CHANGING NEEDS IN A CHANGING ENVIRONMENT

Jensen, A.C. 1977.

New York Fish and Game Journal 24(2):99-128.

Fisheries, Marine environment, Offshore, OCS, Development, New York

The title study discusses the tremendous changes in marine fisheries over the last 25 years, including potential hazards posed by offshore drilling for oil and gas.

[from Oceanic Abstracts 15(4): #78-05206. 1978]

80A-0489

EKOFISK BLOWOUT AND AFTER

Johnston, R. 1978.

Scottish Fisheries Bulletin, Vol.44:44-47.

Ekofisk blowout, North Sea, Environmental effects, Oil slicks

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:32, #3754. 1979]

80A-0490

THE MARINE ALGAE OF THE POLLUTED INNER PART OF THE OSLO FJORD: A SURVEY CARRIED OUT 1962-1966

Klavestad, N. 1978.

Botanica Marina 21(2):71-97.

Algae, Contamination, Benthos, Norway, *Oslo fjord

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

7. General Aspects

An investigation was conducted on the benthic algal vegetation of the inner, polluted part of the Oslo Fjord from 1962 to 1966. This report discusses the distribution patterns of the various algae on the basis of the available data on salinity, temperature, currents, pollution, and other ecological factors. Information on life cycle stages of the various species is also presented. [possibly oil pollution related]

[from Oceanic Abstracts 15(4): #78-05188. 1978]

80A-0491

THE AMOCO CADIZ OIL SPILL - LINES OF STUDY AND EARLY OBSERVATIONS

Laubier, L. 1978.

Marine Pollution Bulletin 9(11):285-287.

Amoco Cadiz spill, Fate, Behavior, Monitoring, Sediments, Seawater, Biodegradation, Microorganisms, Toxicity, Fish, Birds

A summary of the French CNEXO program assessing the ecological impact of the Amoco Cadiz spill is presented. The research efforts included: 1) Monitoring the chemical quality of the water, sediments, and marine organisms; 2) study of the ecological effect; 3) microbiological processes; and 4) toxicological aspects. General conclusions are offered on the spreading and dispersal of the oil, effects on birds, zooplankton, fish larvae, and commercial fishing activities.

80A-0492

INVESTIGATIONS MADE DURING THE EKOFISK BLOW-OUT

Law, R.J. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap. Rep., Report No. C.M. 1977/E:31. 8p.

Ekofisk blowout, North Sea, Environmental effects, Behavior, Fate,
*Research review

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:33, #3768. 1979]

80A-0493

AMOCO CADIZ OIL SPILL

Lewis, J. (ed.). 1978.

Marine Pollution Bulletin 9(1):281-311. Special issue.

Amoco Cadiz spill, Environmental effects, Marine organisms, Coasts, Sampling, Ecosystems, France, *Special issue

"The wreck of the Amoco Cadiz was the most spectacular and potentially most damaging marine pollution event to date. . . the many studies cur-

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
7. General Aspects

rently taking place or completed already permit some interim descriptions and assessments. Accordingly this issue of the Bulletin is devoted entirely to a number of reports. . ." Abstracted separately in this issue of OPA are articles by M.F. Spooner; L. Laubier; D.A. Wolfe; J.H. Vandermeulen, et al.; R.J. Law; P.R. Mackie; C. Chasse; N.A. Holme; L. Cabioch; and P.H. Jones, et al. [see author index]

80A-0494

FIELD AND EXPERIMENTAL OBSERVATIONS IN RELATION TO THE EKOFISK OIL BLOWOUT

MacIntyre, A.D., J.M. Davies, L. Massie, R. Hardy, et al. 1977. International Committee for Exploration of the Sea, ICES C.M. Pap. Rep., Report No. C.M. 1977/E:52. 13p.

Ekofisk blowout, North Sea, *Research review

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:33, #3770. 1979]

80A-0495

RIVER POLLUTION PROBLEMS AT PRESTWICK AIRPORT

McL Traill, I. 1979.

Effluent & Water Treatment Journal, 19(9):473-479.

Gasoline, Groundwater, Rivers, UK, *Airports

Oil pollution studies were made from 1976-1978 at Prestwick Airport. It was found that spillages from large oil installations might give rise to serious long-term pollution problems. Most spillages were actually small; however, aviation fuel has been found in the water-table.

80A-0496

POLLUTION OF THE MARINE ENVIRONMENT

Malins, D.C. 1980.

Environmental Science and Technology 14(1):32-37.

Chemical analysis, Biodegradation, Oxidation, Chemical effects, Marine organisms, Amoco Cadiz spill

Crude oils may contain as much as 50% polar organic compounds, since most of these hydrocarbons are readily oxidized into them through chemical and biochemical reactions. The polar organic compounds formed are of unknown toxicity and cannot be quantified by conventional chromatographic techniques. The presence of hydrocarbon bioconversion products in marine organisms is being used to quantify petroleum pollution from the Amoco Cadiz oil spill.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

7. General Aspects

80A-0497

THE GROUNDING OF THE AMOCO CADIZ. ACTION BY ISTPM [in French]

Maurin, C. 1978.

La Pêche Maritime, No.1206:508-513.

Amoco Cadiz spill, Spill response, France, Contingency planning, *ISTPM

Summary not available.

[from Marine Pollution Research Titles 6(7): #1243. 1979]

80A-0498

POLLUTION IN PERSPECTIVE [book review]

Mellanby, K. 1979.

Nature 282(5735):155-156.

Hydrocarbons, Fate, Behavior, Pollution control, Cost analysis, Environmental effects, Book review

Reviewed is the book A Perspective of Environmental Pollution [M.W. Holdgate. London, Cambridge University Press, 1979. x + 278p.]. Topics covered in the book include a definition of pollutants, their pathways in the environment, adverse changes in the environment, and the monitoring, surveillance, costs and controls of pollution, including oil pollution. "This is a book which deserves a wide circulation."

80A-0499

A BIBLIOGRAPHY ON MARINE AND ESTUARINE OIL POLLUTION. SUPPLEMENT 3

Moulder, D.S. and A. Varley. 1979.

Plymouth Marine Biological Association of the United Kingdom, Marine Pollution Information Centre, 1979. 119p.

Bibliographies, Marine environment, Estuaries, Environmental effects

This supplement to over 3460 citations published prior to April 1978 contains an additional 900 references to the literature on marine and estuarine oil pollution. Excluded are "papers on the effects of oil pollution on seabirds, on the legal, economic and social aspects, and on pollution schemes."

80A-0500

NAPHTHALENE - INDUCED CRAYFISH MUSCLE MEMBRANE HYPERPOLARIZATION

Nelson, D.O. and A.W. Mangel. 1979.

Comparative Biochemistry and Physiology 63C(2):309-311.

Aromatic hydrocarbons, Biological effects, Crustaceans, *Crayfish, *Physiological effects, *Naphthalene

The title study discusses the effects of naphthalene on the crayfish neuromuscular junction. In particular, walking leg muscle cell resting potentials and excitatory postsynaptic potentials (EPSPs) were studied in an attempt to assess the physiological effects of this petroleum pollutant.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
7. General Aspects

80A-0501

ENVIRONMENTAL PHOTOOXIDATION OF DIBENZOTHIOPHENES FOLLOWING THE AMOCO CADIZ OIL SPILL

Patel, J.R., E.B. Overton, and J.L. Laseter. 1979.
Chemosphere 8(8):557-561.

Chemical analysis, GC/MS, Oxidation, Amoco Cadiz spill

An oil sample from the Amoco Cadiz oil spill was examined and found to contain photooxidation products of dibenzothiophenes. These products were analyzed quantitatively by mass spectrometry and qualitatively by liquid/solid chromatography fractionation and high resolution gas chromatography-mass spectrometry.

80A-0502

GROUND-WATER POLLUTION - AN IMMINENT DISASTER

Pettyjohn, W.A. 1979.
Ground Water 17(1):18-24.

Industries, Contamination, Leakage, Oil discharges, Groundwater, Wastewaters, Disposal

This article, using examples from around the world, points out the imminent dangers of groundwater pollution, and the long-lasting effects of such pollution once groundwater has been contaminated. Examples cited include those of oil field brines, petrochemicals, and oily wastewaters from various industries.

80A-0503

THE AMOCO CADIZ CATASTROPHE [IN FRENCH]

Philiponeau, P. 1978.
Revue Maritime, (Nouv. Ser.), No. 338:2099-2106.

Amoco Cadiz spill, Environmental effects, Coasts, France

Summary not available.

[from Marine Pollution Research Titles 6(7): #1251. 1979]

80A-0504

NATURAL OIL SEEPAGE MAY EXCEED ESTIMATES

Posey, C. 1980.
Environmental Data Information Service 11(1):20-21.

Natural seepage, Atlantic Ocean, Crude oil, NOAA

An oil-rich layer hundreds of feet beneath the surface of the southwestern N. Atlantic, apparently caused by a natural oil seep, is estimated to contain at least a million tons of crude oil. The discovery reported by the NOAA, may force a revision of the estimate of the amount of oil naturally present in the sea.

[from Petroleum Abstracts 20(19): #275,764. 1980]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
7. General Aspects

80A-0505

POLLUTION-SEARCH FOR PANACEAS [BOOK REVIEW]

Pritchard, S.Z. 1980.

Marine Policy 4(1):83-84.

Environmental effects, Oil spills, Exploration, Production, Book review

A review is given of The Prevention of Oil Pollution [J. Wardley-Smith (ed.) London, Graham & Trotman. 1979. 309p.] a volume of 14 essays discussing a range of topics including waste management, the ecological effects of oil pollution, oil pollution during exploration, production, and transportation.

80A-0506

VOLATILE LIQUID HYDROCARBONS IN THE MARINE ENVIRONMENT

Sauer, T.C., Jr. 1978.

Texas A & M University Ph.D Dissertation. 333p.

Hydrocarbons, Marine environment, Concentrations, Chemical analysis, Sources, Toxicity, Gulf of Mexico, Marine organisms, *Volatile liquid fractions

A study was conducted of the concentrations, distributions, sources, chemical characteristics, and toxic effects of volatile liquid hydrocarbons (VLH) of the C₆-C₁₄ range in the coastal, shelf, and open ocean surface waters of the Gulf of Mexico. Heavily polluted Louisiana shelf and coastal waters had up to about 500 ng/L VLH, nonpolluted open ocean contained about 60 ng/L, Caribbean surface waters had only about 30 ng/L. Aromatic VLH accounted for 60-85% of the total VLH in surface waters. Petroleum production and transport were among major non-atmospheric sources of VLH, as was natural hydrocarbon seepage. "Evidence is presented showing that VLH at sublethal concentrations of 1 µg/L cause detrimental effects to the life processes of many marine organisms.

[from Dissertation Abstracts B 39(11):5282-5283. 1979]

80A-0507

OIL DISCHARGES IN FINNISH COASTAL WATERS FROM 1970 TO 1974

Soikkeli, M. and J. Virtanen. 1978.

Symposium on Sea Ducks, Stockholm, 16-17 June 1975.

A. Andersson and S. Fredga (eds.). Stockholm, National Swedish Environment Protection Board, 1978. p. 12-13.

Oil discharges, Coastal waters, Birds, Finland

Summary not available.

[from Marine Pollution Research Titles 5(9): #1583. 1979]

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

7. General Aspects

80A-0508

TEXAS SURVIVING WORST OIL SPILL, BUT EXPERTS SAY HARM MAY NOT BE KNOWN FOR YEARS

Stevens, W.K. 1979.

New York Times, August 11, 1979:6.

Spill cleanup, Ixtoc I blowout, Texas, Coastal waters, Oil slicks, Environmental effects, Behavior

The Compeche oil spill is expected to have a long and drawn out impact on the Texas coast, due to the fact that the slick has broken up into patches of varying characteristics. Some cleanup efforts are described.

[from Environment Abstracts 9(10): #79-05960. 1979]

80A-0509

SCIENTISTS PROTEST OIL THREAT TO MARINE LIFE

Sullivan, T. 1980.

National Fisherman 60(10):44.

Environmental effects, Oil spills, Chronic effects

Evidence presented indicates the serious lasting impacts on marine life from oil pollution. Summarized results of laboratory tests and field observations are given.

80A-0510

A STUDY TO EVALUATE THE COMBUSTIBILITY AND OTHER PHYSICAL AND CHEMICAL PROPERTIES OF AGED OILS

Twardus, E.M. 1979.

Department of Fisheries and Environment, Canada, DSS File No. 03SS, KE204-8-1011. Draft Report available from R & D Division, Environmental Emergency Branch, EPS.

Petroleum products, Weathering, Arctic, Burning, *Chemical-physical aspects, *Combustibility, *Residual oils

"Oil aging and the formation of water in oil emulsions were studied in Arctic spring conditions using Bunker C, marine diesel, and six crude oils. The igniter systems used demonstrated that these oils could be burned if oil thickness were 3-6mm up to 4 weeks after release, except Bunker C which needed 10mm combustion of crude oils without emulsions was reported possible, 20% water easily ignited with higher water content being harder to ignite, but once fully developed, combustion of w/o emulsion was very intense except for w/o emulsions which tended to foam."

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION

7. General Aspects

80A-0511

DECISIONS FOR DELAWARE. SEA GRANT LOOKS AT OIL SPILLS

University of Delaware, College of Marine Studies. 1977.

Newark, University of Delaware, College of Marine Studies, 1977.

Environmental effects, Oil spills, Delaware, Atlantic coast, *Sea grant research

[summary not available]

[from Marine Pollution Research Titles 5(10): #1706. 1978]

80A-0512

IMMEDIATE IMPACT OF AMOCO CADIZ ENVIRONMENTAL OILING: OIL BEHAVIOR AND BURIAL, AND BIOLOGICAL ASPECTS

Vandermeulen, J.H., D.E. Buckley, E.M. Levy, B. Long, P. McLaren and P.G. Wells. 1978.

Actes des Colloques du Centre National pour l'Exploitation des Oceans, No. 6:159-174.

Acute effects, Environmental effects, Behavior, Sedimentation, Coasts, Amoco Cadiz spill

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:31, #3752. 1979]

80A-0513

THE SPREADING RETENTION AND CLEAN-UP OF OIL SPILLS

Wilson, M.P. et al. 1978.

University of Rhode Island, Report HCP/P2756-01, UC-11, Contract No. (11-1) 2756. 126p.

Oil spills, Statistics, Behavior, Environmental effects, Spill cleanup, Tankers, Ships, Biodegradation, Spill containment, *General review

This publication summarizes current information on the following 8 topics: Oil spill statistics; ship and tanker-generated pollution; spreading and drift of oil slicks; containment devices and technology; natural and forced biodegradation of spills; natural and chemical dispersion of oil into the marine environment; and research and development needed to mitigate environmental effects of oil pollution.

C. ENVIRONMENTAL IMPACTS OF OIL POLLUTION
7. General Aspects

80A-0514

FATE AND EFFECTS OF CONTAMINANTS IN MARINE ECOSYSTEMS AND ORGANISMS

Wolfe, D.A. 1977.

Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems. C. Hall and W. Preston (eds.). Report EPA/600/7-77/111. p. 93-105.

Fate, Environmental effects, Contamination, Hydrocarbons, Marine organisms, Ecosystems, NOAA

This paper reviews 1975-76 research efforts of the NOAA National Analytical Facility (NNAF) in assessing the fate and effects of petroleum hydrocarbons and toxic metals in marine organisms and ecosystems. The objectives and design of individual projects within the program are outlined.

D. FATE OF OIL IN THE ENVIRONMENT

1. Biodegradation

80A-0515

STIMULATED PETROLEUM BIODEGRADATION

Atlas, R.M. 1977.

CRC Critical Reviews in Microbiology 5:371-386.

Biodegradation, Physical aspects, Chemical effects, Oxidation, Spill cleanup, Microorganisms, Land farming, *Stimulation

Physical or chemical means for stimulating petroleum biodegradation include removal of particular petroleum fractions by dissolution, burning, and emulsification. Modification of environmental parameters (such as concentrations of essential nutrients, especially nitrogen, phosphorus, and oxygen) has shown the greatest promise for stimulating petroleum biodegradation. Forced aeration and addition of commercial fertilizer combinations in contained systems, addition of fertilizer with tilling in soil, and addition of fertilizer that has been rendered oleophilic in open systems have all been shown to effectively stimulate petroleum biodegradation. Modification of microbial populations by seeding with oil-degrading microorganisms appears to be valuable in stimulating petroleum biodegradation only in limited situations where the naturally occurring numbers of hydrocarbon-degrading microorganisms are low.

[from Bio Science 28(6):391]

80A-0516

CRUDE OIL BIODEGRADATION IN ARCTIC TUNDRA PONDS

Bergsteen, P., N. Garg, T. Geisbuhler and J.R. Vestal. 1978. American Society for Microbiology, 78th Annual Meeting, Las Vegas, Nevada, 1978. R. Slepecky (ed.). Washington, DC, American Society for Microbiology, 1978. p. 207. Abstract No. Q 77.

Biodegradation, Crude oil, Microorganisms, Arctic, *Tundra ponds, *Phosphate fertilizer addition

Isolated arctic tundra ponds were treated with oil and/or oleophilic or inorganic phosphate fertilizers in an attempt to enhance the degradation of the oil by indigenous microflora. The data indicate that addition of oleophilic phosphate to crude oil spilled on tundra ponds increases the biodegradation of the oil during the ice-free season.

80A-0517

DEGRADATION OF PETROLEUM BY A PSYCHROTOLERANT MARINE FLORA FROM THE ESKIMO LAKES, NORTHWEST TERRITORIES

Bunch, J.N., and R.C. Harland. 1977

A Series of Four Reports on the Marine Ecology of the MacKenzie Delta and Tuktoyaktuk Peninsula Region. Ste. Anne de Bellevue, Quebec, Arctic Biological Station, 1977. p. 1-30.

D. FATE OF OIL IN THE ENVIRONMENT

1. Biodegradation

Biodegradation, Crude oil, Plants, Marine organisms, Arctic, Canada

Summary not available. [See also related entry by Arctic Biological Station in this issue, OPA.]

[Marine Pollution Research Titles 5(7): #1241. 1978]

80A-0518

ECOLOGICAL ASPECTS OF MICROBIAL DEGRADATION OF PETROLEUM IN THE MARINE ENVIRONMENT

Colwell, R.R. and J.D. Walker. 1977.

CRC Critical Reviews in Microbiology 5:423-445.

Biodegradation, Environmental effects, Microorganisms, Pollution control, Spill response, *Contained spills

"Microbial degradation of petroleum in the marine environment occurs at different rates, depending upon nutrient concentration, temperature, salinity, and other environmental factors. Microbial degradation has been shown to be affected by the composition of the petroleum, some fractions being degraded readily and others more slowly, if at all. Microorganisms in water and sediment differ in petroleum-degradative potential. Similarly, microorganisms found in polluted environments degrade petroleum differently, both qualitatively and quantitatively, than microorganisms indigenous to unpolluted environments. Because the biodegradation of petroleum in the marine environment is influenced by a number of complex ecological factors, microbial seeding of oil spills offers promise mainly for contained spills or lagooned effluent...."

[from Bio Science 28(6):391]

80A-0519

MUTAGENIC ACTIVITY RESULTING FROM CRUDE OIL DEGRADATION BY THE NATURAL MICROBIAL POPULATION IN SUBARCTIC RIVER WATER

Cummings, B.A., R.C. Gordon, and S.M. Morrison. 1978

American Society for Microbiology, 78th Annual Meeting, Las Vegas, Nevada, 1978. R. Slepecky (ed.). Washington, DC, American Society for Microbiology, 1978. p. 207. Abstract No. Q 74.

Biodegradation, Crude oil, Microorganisms, Rivers, Freshwater, Arctic, *Mutagenic activity

Prudhoe Bay crude oil and river water were incubated in flasks at 4° and 20° C to determine if mutagenic activity of the oil was increased during microbial degradation. High mutagenic activity was detected in summer, little activity in winter months. The increased mutagenic activity appeared to be directly related to surface runoff water entering the river.

D. FATE OF OIL IN THE ENVIRONMENT

1. Biodegradation

80A-0520

THE BIODEGRADATION OF OIL SLUDGE IN SOIL

Dibble, J.T. and R. Bartha. 1978.

American Society for Microbiology, 78th Annual Meeting, Las Vegas, Nevada, 1978. R. Slepecky (ed.). Washington, DC, American Society for Microbiology, 1978. p. 206. Abstract No. Q 71.

Biodegradation, Land farming, Sludge, Soil, Disposal, Storage, Refineries

Parameters affecting the biodegradation of oil sludge in soil were studied in order to develop optimal management practices for disposal of oil storage and refinery wastes. "As determined by respirometry and residue analysis, the highest rate and extent of oil sludge biodegradation was found to occur in soil at a slightly alkaline reaction and mesophilic temperature." By dividing the maximum useful loading rate of 10% w/w per year into four separate applications per growing season, the extent of biodegradation was doubled.

80A-0521

LEACHING ASPECTS OF OIL SLUDGE BIODEGRADATION IN SOIL

Dibble, J.T. and R. Bartha. 1979.

Soil Science 127(6):365-371.

Biodegradation, Sludge, Land farming, Soil, Groundwater, *Leachates

Tests were conducted to ascertain the completeness of hydrocarbon biodegradation during land application of waste oil sludges. No undegraded hydrocarbons appeared in the leachate. It is concluded on the basis of this and other tests that ground aquifers are not likely to be contaminated by judiciously operated land farming sites.

[from Environment Abstracts 9(9): #79-05428. 1979]

80A-0522

ENZYME RECRUITMENT ALLOWS THE BIODEGRADATION OF RECALCITRANT BRANCHED HYDROCARBONS BY PSEUDOMONAS CITRONELLOLIS

Fall, R.R., J.L. Brown and T.L. Schaeffer. 1979.

Applied Environmental Microbiology 38(4):715-722.

Biodegradation, Microorganisms, *Pseudomonas citronellolis, *Recalcitrant branched hydrocarbons

"Experiments were performed to construct pseudomonad strains capable of the biodegradation of certain recalcitrant branched hydrocarbons via a combination of alkane and citronellol degradative pathways.... These studies demonstrate how enzyme recruitment can provide a pathway for the biodegradation of otherwise recalcitrant branched hydrocarbons."

[from Petroleum Abstracts 20(18):275,439. 1980]

D. FATE OF OIL IN THE ENVIRONMENT

1. Biodegradation

80A-0523

THE BACTERIOLOGY OF AN ACTIVE OIL FIELD IN THE NORTHWESTERN GULF OF MEXICO

Faw, G.M., S.L. Hollaway and R.K. Sizemore. 1979.

American Society for Microbiology, 79th Annual Meeting, Los Angeles, 1979. R. Slepecky (ed.). Washington, DC, American Society for Microbiology, 1979. p. 233. Abstract No. Q 83.

Biodegradation, Bacteria, Offshore, Oil fields, Gulf of Mexico, *Bacteriological aspects

In a one year study of a 15-year old active oil field, the taxonomic composition, distribution and physiological profile of bacteria from the oil field were compared to those collected from a control site. Oil-and sulfur-utilizing bacteria were more common in the oil field area than in the control site. Pseudomonas was the most common genus found; others included Vibrio, Aeromonas, Moraxella, and Acinetobacter.

80A-0524

DEGRADATION OF CRUDE OIL BY MIXED POPULATIONS OF BACTERIA FROM THE SURFACE MICROLAYER IN AN ESTUARINE SYSTEM

Fehon, W.C. and J.D. Oliver. 1977.

Journal of the Elisha Mitchell Scientific Society 93(2):72-73.

Biodegradation, Bacteria, Freshwater, Coasts, Estuaries, North Carolina

Because of proposed oil drilling in coastal North Carolina, a study was undertaken of bacteria present in the surface microlayer and their ability to degrade crude oil. Results of studies near Wilmington, North Carolina indicate that "the bacteria occurring in the subsurface samples... were capable of greater utilization of crude oil as compared to that population occurring in the surface microlayer."

80A-0525

DEGRADATION OF SELECTED POLYCYCLIC AROMATIC HYDROCARBONS IN COASTAL SEDIMENTS: IMPORTANCE OF MICROBES AND POLYCHAETE WORMS

Gardner, W.S., R.F. Lee, K.R. Tenore and L.W. Smith. 1979.

Water, Air and Soil Pollution 11(3):339-347.

Biodegradation, PAH, Coastal waters, Sediments, Benthos, Microorganisms, Annelids, *Polychaete worms

"Rates of degradation of polycyclic aromatic hydrocarbons (PAH) were examined after addition of crude oil enriched with anthracene, fluoranthene, benz(a)anthracene, and benzo(a)pyrene to coastal sediments in a laboratory (20°) flowing seawater system. Three types of sediment (fine sand, medium sand, and marsh sediment) with and without the benthic polychaete worm, Capitella capitata were used." PAH concentrations were then measured, showing significant decreases in the fine and medium sand size range.

D. FATE OF OIL IN THE ENVIRONMENT

1. Biodegradation

80A-0526

THE MICROBIAL DEGRADATION OF CRUDE MINERAL OILS AT SEA

Gilbert, P.D. and I.J. Higgins. 1978.

Journal of General Microbiology 108(1):63-70.

Biodegradation, Crude oil, Tar sands, Bacteria, Seawater, Hydrocarbons, Equipment, Physical effects, *Temperature

"A new experimental procedure and robust equipment have been developed for studying oil degradation at sea and the system has been proved under harsh environmental conditions." Three crude oils of significantly different composition that were tested were Athabasca sand tar, its synthetic crude derivative, and a North Sea Forties crude oil. Average degradation rates at 12° C were approximately three times greater than at 5° C. For the Forties and the synthetic crude, the saturate fraction was degraded most rapidly, but in the tar sand, the monoaromatic fraction was degraded most rapidly.

80A-0527

PETROLEUM-DEGRADING POTENTIAL OF MIXED BACTERIAL POPULATIONS FROM ROADSIDE ENVIRONMENTS

Johnson, J.W., M.P. Walienista, R.J.Wodzinski and R.N. Gennaro. 1979.

American Society for Microbiology, 79th Annual Meeting, Los Angeles,

1979. R. Slepecky (ed.). Washington, DC, American Society for Microbiology, 1979. p. 224. Abstract No. Q 32.

Biodegradation, Bacteria, Soil, Onshore, Petroleum products, *Roadside environments, *Highway runoff

Bacteria from soils along highways were examined for the ability to degrade kerosene and diesel fuels. Soils 0.75 m from the edge of the roadway were found to contain twice the number of biodegrading bacteria compared to soils 6.0 m from the pavement. Wet soils and soils exposed to highway runoff also had higher numbers of biodegrading bacteria present. The type of ditch construction for stormwater runoff was found to influence the rate of hydrocarbon oxidation from highway runoff.

80A-0528

EUROPEAN ATLANTIC MARGIN: MORE DRILLING REQUIRED

King, R.E. 1977.

World Oil 185(7):59-62.

Biodegradation, Oil slicks, Product information

This article primarily discusses sedimentary basins and offshore structures in Western Europe. Briefly described is a powdered bacterial product developed by the Natural Hydrocarbon Elimination Co. to transform oil slicks into a nondamaging material. The converted oil slick material is said to "...actually propagate the marine life food chain, from plankton to fish."

[from Oceanic Abstracts 15(4): #78-05377. 1978]

D. FATE OF OIL IN THE ENVIRONMENT
1. BIODEGRADATION

80A-0529

EFFECTS OF TILLAGE AND FERTILIZATION ON PERSISTENCE OF CRUDE OIL
CONTAMINATION IN AN ALASKAN SOIL

Mitchell, W.W., et al. 1979.

Journal of Environmental Quality 8(4):525-533.

Biodegradation, Crude oil, Land farming, Plants, Soil, Fate, Contami-
nation, Alaska

The effects of tillage on plant growth, as a function of soil depth
were determined in a greenhouse bioassay of soil samples taken from
oil fields. Tillage alone was more effective than fertilization alone
in promoting the growth of plants on oiled soils. Tillage and fertili-
zation together was more effective than either treatment by itself.

[from Environment Abstracts 10(1): #80-00314. 1980]

80A-0530

ANALYSIS OF CARBON IN AN EXPERIMENT ON BIODEGRADATION OF CRUDE OIL BY
BACTERIA

Oudot, J. 1979.

Environmental Pollution 20(3):177-187.

Biodegradation, Crude oil, Hydrocarbons, Bacteria, Soil, Chemical analysis

This experiment determined the different hydrocarbons in crude oil
biodegraded by soil bacteria for 21 days. Analyses by column fraction-
ation and gas-liquid chromatography show that the saturate fraction was
40% degraded and the aromatic fraction was 18% degraded. An increase
in the asphaltic fraction was demonstrated, no increase was noted in
long chain paraffins, and pristane and phytane were completely biodegraded.

[from Petroleum Abstracts 20(15): #274,598. 1980]

80A-0531

THE EKOFISK BRAVO BLOWOUT: OIL DEGRADING BACTERIA AND FUNGI

Pedersen, S. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap. Rep.,
Report No. C.M. 1977/E:55. p. 6:1-6:9.

Ekofisk blowout, North Sea, Bacteria, Fungi

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder
and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979.
Supplement 3:33, #3772. 1979]

D. FATE OF OIL IN THE ENVIRONMENT

1. Biodegradation

80A-0532

TRANSFORMATION OF 2,5-DIPHENYLOXAZOLE AND DERIVATIVES BY MIXED FUNCTION OXIDASES OF A MARINE FISH

Penrose, W.R., R.G. Murphy, L.L. Dawe, M.D. White, et al. 1979.
Chemosphere 8(8):509-520.

Biodegradation, Metabolism, Fish, Bioindicators, Monitoring

"Cunner fish (*Tautoglabrus adspersus*) kept in oily seawater to induce aryl hydrocarbon hydroxylase activity and then given 2,5- dephenyloxazole metabolized it to 2-(4- methoxyphenyl) - 5- phenylaxazole). Thus, cunner fish could be used to monitor petroleum water pollution.

80A-0533

MICROBIAL METABOLISM OF CYCLIC HYDROCARBONS AND RELATED COMPOUNDS

Perry, J.J. 1977.

CRC Critical Reviews in Microbiology 5:387-412.

Biodegradation, Microorganisms, Aromatic hydrocarbons, Hydrocarbons, Metabolism

"Topics discussed include: the enzymes involved in biodegradation of cycloparaffins and probable intermediates involved in the metabolism of cycloparaffinic hydrocarbons; the aromatization of the cycloalkane ring in the aerobic degradation of cyclohexane and the reduction of benzoate in anaerobic metabolism of heterotrophs and photosynthetic bacteria; the incorporation of cycloalkanes with n-alkyl side chains into cellular lipids; and the biodegradation of terpenes and related compounds by microorganisms."

[from Bio Science 28(6):391. 1978]

80A-0534

MICROBIAL OXIDATION OF METHYL BRANCHED ALKANES

Pirnik, M.P. 1977.

CRC Critical Reviews in Microbiology 5(4):413-422.

Hydrocarbons, Metabolism, Oxidation, *Alkanes

"Branched alkanes are susceptible to oxidation in a variety of microorganisms. When utilized for growth, branched alkanes undergo transformation as fatty acids, and may be assimilated by microorganisms along established metabolic pathways. Some bacteria oxidize branched alkanes like pristane by means of strictly catabolic dicarboxylic acid pathways, in addition to the assimilatory mechanisms found in n-alkane utilizers." [possibly oil pollution related]

D. FATE OF OIL IN THE ENVIRONMENT

1. Biodegradation

80A-0535

MICROBIAL GROWTH ON HYDROCARBONS: TERMINAL BRANCHING INHIBITS
BIODEGRADATION

Schaeffer, T.L., S.G. Cantwell, J.L. Brown, D.S. Watt and R.R. Fall. 1979.
Applied Environmental Microbiology 38(4):742-746.

Biodegradation, Microorganisms, Bacteria, Fungi, Hydrocarbons

Twenty seven varieties of octane-utilizing bacteria and fungi were screened for growth on some terminally branched dimethyloctane derivatives to explore the effects of iso- and anteiso-termini on the biodegradability of such hydrocarbons. "None of the hydrocarbonoclastic yeasts tested was able to utilize branched-hydrocarbon growth substrates. This microbial sampling illustrated the deleterious effect of alkyl branching, especially anteiso-terminal branching on the biodegradation of hydrocarbons."

[from Petroleum Abstracts 20(18): #275,440. 1980]

80A-0536

CRUDE OIL SPILLED ON ARCTIC TUNDRA SOILS: FATE AND EFFECT ON MICROBIAL
POPULATIONS

Sexstone, A.J. 1979.

Masters Abstracts. U.S. & Canada 17(1):18.

Biodegradation, Microorganisms, Soil, Crude oil, Arctic, Fate,
Biological effects, *Tundra

Five arctic tundra soils were experimentally treated in situ with Prudhoe crude oil to determine the microbial response, the penetration and persistence of oil in these soils. Onset of oil biodegradation was detectable after 6 weeks of exposure and became increasingly noticeable in the soil column. Upon examining older spill sites it was concluded that even readily degradable n-paraffins will persist in tundra soils for over a decade.

[from Petroleum Abstracts 19(49): #270,518. 1979]

80A-0537

PHENANTHRENE BIODEGRADATION IN FRESHWATER ENVIRONMENTS

Sherrill, T.W. and G.S. Sayler. 1980.

Applied and Environmental Microbiology 39(1):172-178.

Biodegradation, Sampling, Microorganisms, PAH, Freshwater, *Phenanthrene

The purpose of this investigation was the evaluation of the potential for significant polycyclic aromatic hydrocarbon (PAH) degradation by the indigenous microbial populations in fresh water environments. PAH degradation was directly correlated with the historical environmental pollution of the sampling sites examined, the length of biodegradation assessment, temperature, and the molecular size of the polycyclic aromatic hydrocarbon substrate. [possibly oil pollution related]

D. FATE OF OIL IN THE ENVIRONMENT

1. Biodegradation

80A-0538

BACTERIAL DEGRADATION OF CRUDE OILS. IDENTIFICATION BY CARBON ISOTOPES

Stahl, W.J. 1979.

American Association of Petroleum Geologists Bulletin 63(4):701. Abstract.

Biodegradation, Crude oil, Bacteria, Chemical analysis, *Carbon isotopes

The recently developed isotope type-curve technique for oil/oil and oil/source rock correlation is based on the determination of the carbon isotope ratios of different crude oil fractions. This method can be used for the identification of bacterial oxidation of crude oils and might be useful in controlling the rate of degradation after environmental catastrophes such as oil spills. Laboratory experiments show the change in compositional and isotopic data of a crude oil and of gases which are dissolved in the oil under attack.

80A-0539

APPLICATION OF MICROBIOLOGY TO ENERGY AND ENVIRONMENT

Yen, T.F. 1977.

Ann Arbor, Michigan, Ann Arbor Science Publishers, 1977. -p.

Biodegradation, Microorganisms, Environmental effects

Summary not available. [possibly oil pollution related]

[from Ann Arbor Science Publishers Announcement. 1979]

80A-0540

MICROBIAL RECOVERY OF HYDROCARBONS

Yen, T.F. 1978.

Energy Sources 3 (3/4):385-387.

Biodegradation, Oil removal, Hydrocarbons, Microorganisms, Bacteria,
*Enhanced oil recovery

Recommendations concerning research approaches and directions in the microbial recovery of petroleum hydrocarbons are presented. These include the development and use of microorganisms for removal of petroleum pollutants from the environment.

[from Waste Materials Biodegradation Research Titles 6(2):42,
#79/2-UU-1588. 1979]

D. FATE OF OIL IN THE ENVIRONMENT
2. Physical and Chemical Processes

80A-0541

COMPARATIVE STUDY OF PETROLEUM CONTAMINATION IN THE MARINE ENVIRONMENT.
I. FLUOROMETRIC STUDY [IN FRENCH]

Awad, H. 1977.

Revue des Travaux de l'Institut des Peches Maritimes No. 41:375-388.

Hydrocarbons, Marine environment, Contamination, Chemical analysis,
*Fluorometry

Summary not available.

[from Marine Pollution Research Titles 6(10): #1804. 1979]

80A-0542

LABORATORY STUDY OF LIQUID PHASE CONTROLLED VOLATILIZATION RATES IN
PRESENCE OF WIND WAVES

Cohen, Y., W. Cocchio and D. MacKay. 1978.

Environmental Science and Technology, Vol. 12:553-558.

Evaporation, Oil slicks, Physical aspects, *Wind waves

Summary not available. [possibly oil pollution related]

[from Marine Pollution Research Titles 5(9): #1566. 1978]

80A-0543

HYDROCARBONS IN WESTERN NORTH ATLANTIC SURFACE SEDIMENTS

Farrington, J.W. and B.W. Tripp. 1977.

Geochimica et Cosmochimica Acta, Vol. 41:1627-1641.

Hydrocarbons, Petroleum products, Fate, Sediments, Movement, Atlantic
Ocean, *New York Bight

Fossil fuel hydrocarbons represent the bulk of hydrocarbons in the
New York Bight dump site area. Concentrations of hydrocarbons at the
edge of the continental shelf as well as in sediments in the abyssal
plain sediments indicates transport of land-derived organic matter
to deep ocean areas. Details on composition, site locations, and
study procedures are provided.

[from Marine Pollution Research Titles 5(9): #1570. 1978]

D. FATE OF OIL IN THE ENVIRONMENT
2. Physical and Chemical Processes

80A-0544

THE INTERCEPTION OF EMULSIFIED HYDROCARBONS IN WATER BY MEANS OF
HYDROPHOBIC MATERIAL: MECHANISM, DYNAMIC AND KINETIC ASPECTS
[IN FRENCH]

Goma, G. and H. Espinosa. 1979.
Water Research 13(12):1129-1136.

Emulsification, Oil removal, Oil-water separation, Physical aspects

The kinetic laws and the mechanism which control the rate of hydrocarbons
removal from water were studied using hydrophobic granular material.

[from Petroleum Abstracts 20(19): #275,782. 1980.]

80A-0545

FURTHER STUDIES OF SUNLIGHT GLITTER ON A WIND-RUFFLED SEA.

Guinn, J.A., G.N. Plass and G.W. Kattawar. 1978.

College Station, Texas A & M University, Department of Physics. 39p.

Behavior, Oil slicks, Sea surface, Physical aspects, *Sunlight glitter

Summary not available. [possibly oil pollution related]

[from Marine Pollution Research Titles 7(2): #296. 1980.]

80A-0546

THE EFFECT OF EMULSION-SOLID INTERACTION ON THE FATE OF EMULSIFIED
CRUDE OIL

Huang, C.P., H.A. Elliott and H. Wang. 1977.

Manuscript Report Series, Marine Sciences Branch, Ottawa, Vol.43:353-358.

Emulsions, Fate, Crude oil, Physical effects, *Emulsion-solid interaction

Summary not available.

[from Marine Pollution Research Titles 4(10): #1736. 1977.]

80A-0547

DRIFT RESPONSE OF MONOMOLECULAR SLICKS TO WAVE AND WIND ACTION

Lange, P. and H. Hühnerfuss. 1978.

Journal of Physical Oceanography 8(1):142-150.

Behavior, Drift, Movement, Physical aspects, Oil slicks, *Wave and
wind action

Reported are the results of laboratory and field studies conducted to
better understand drift responses of monomolecular oil films to wind
and wave action. Studying the behavior of monomolecular slicks finds
applications in crude oil pollution situations because these heavy oil
slicks eventually become monomolecular or surface active as a result
of UV radiation and biodegradation. Monomolecular layer studies also
find application in oil spill containment.

D. FATE OF OIL IN ENVIRONMENT
2. Physical and Chemical Processes

80A-0548

DRIFT VELOCITY OF SURFACE FILMS OVER WAVES

Lin, J.D., M.D. Mohr and G.S. Campbell. 1977.

Hydraulic Engineering for Improved Water Management. Proceedings
[of the] 17th Congress of the International Association for Hydraulic
Research, Baden-Baden, West Germany, 15-19 August 1977. Vol.3:172-179.

Drift, Oil slicks, Behavior, Physical effects

Summary not available.

[from Marine Pollution Research Titles 5(3): #427. 1978.]

80A-0549

SPREADING OF OIL SLICKS IN A WIND-WAVE CHANNEL

Lin, J.D., and G.S. Campbell. 1977.

Storrs, University of Connecticut, Institute of Water Resources. 12p.

Oil slicks, Spreading, Drift, Behavior, Sea surface

"Drift velocities of surface films floating on the water surface under
the action of wind-generated waves were investigated in a wind-wave
channel using polyethylene sheets. Film drift velocity, wave steepness,
drift to shear velocity ratio and air boundary layer interrelationships
are discussed."

[from Marine Pollution Research Titles 5(10): #1713. 1978.]

80A-0550

THE EKOFISK BRAVO BLOWOUT: THE PHYSICAL ENVIRONMENT AND DRIFT OF OIL

Ljoen, R. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap.
Rep., Report No. C.M. 1977/E:55. p.2:1-2:6.

Ekofisk blowout, North Sea, Drift, Behavior, Physical aspects

Summary not available.

[from Marine Pollution Research Titles 6(10): #3769. 1979]

80A-0551

THE ROLE OF ZOOPLANKTON FECAL PELLETS IN THE SEDIMENTATION OF POLY-
CYCLIC AROMATIC HYDROCARBONS IN DABOB BAY, WASHINGTON

Prahl, F.G. and R. Carpenter. 1979.

Geochimica et Cosmochimica Acta 43(12):1959-1972.

Fate, PAH, Chemical effects, Concentrations, Sources, Sediments, Bays,
Washington, Zooplankton, *Fecal pellets

D. FATE OF OIL IN THE ENVIRONMENT
2. Physical and Chemical Processes

Fecal pellets contain most of the PAHs in sediments of the title or Research results indicate that PAH concentrations in the Bay sediment have increased tenfold in the last 80-100 years of deposition "and are introduced into the marine environment by runoff and erosion or atmospheric deposition and are not produced by marine plankton."

80A-0552

THE INFLUENCE OF THE WIND ON THE MOVEMENT OF OIL SLICKS

Thanarajah, J.C. 1977

Queen Mary College, Ph.D. thesis. 160p.

Physical effects, Movement, Behavior, Oil slicks

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:4, #3489. 1979.]

80A-0553

TRANSPORT OF OIL UNDER SMOOTH ICE

Uzuner, M.S., F.B. Weiskopf, J.C. Cox and L.A. Schultz. 1979.

NTIS Report PB-299 235/2SL. 62p.

Crude oil, Ice, Movement, Behavior, Oil slicks, *Currents, *Oil-under-ice

"Previous studies of oil-ice interaction have been limited to spreading under quiescent conditions. The present study examines the current-driven spread of oil under a smooth ice cover. Generalized relations between current speed and oil transport rate are developed and found to be strongly dependent upon the orientation of the oil slick to the direction of current flow. Methods for application are presented."

3. Models, Simulations, and Predictions

80A-0554

TRADING OFF ENVIRONMENT, ECONOMICS, AND ENERGY

Anon. 1978.

Ecology Law Quarterly 7(1):198-199.

Economics, EPA, Fate, Contamination

The title book [House, P.W. Lexington, Mass., D.C. Heath and Company, 1977. 137p.] describes a computer system maintained by the Environmental Protection Agency, which attempts to model the impact of various national environmental strategies on the economy and the environment. This Strategic Environmental Assessment System (SEAS) serves to assess the impact of EPA policies in terms of pollutant tonnage released into the biosphere for up to 25 years into the future. [possibly oil pollution related]

D. FATE OF OIL IN THE ENVIRONMENT
3. Models, Simulations, and Predictions

80A-0555

DEVELOPMENT OF OCEAN OIL SPILL CONCENTRATION AND TRAJECTORY FORECAST
MODELING METHODS

Barrientos, C.S. 1977.

Program Review Proceedings of: Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems. C. Hall and W. Preston (eds.). Report EPA/600/7-77/111. p.271-282.

Predictions, Concentrations, Movement, Spill trajectories, Weathering, Spreading

A model is proposed for predicting the concentration and trajectories of petroleum in the open ocean. The model covers various kinds of sources, i.e. continuous point leakage, individual spill, or a spill added to a background level of pollution. The model will also incorporate weathering, spreading, diffusion, and transport of the oil.

80A-0556

AN EFFICIENT COMPUTATIONAL ALTERNATIVE TO USING LINEAR PROGRAMMING
TO DESIGN OIL POLLUTION DETECTION SCHEDULES

Daniel, L.E., Jr., S. Hart and T.J. Hodgson. 1977.

Gainesville, University of Florida, Industrial and Systems Engineering, 1977. 12p.

Analytical techniques, Detection, Information systems, Models, Design-engineering

Summary not available.

[from Marine Pollution Research Titles 5(11): #1898. 1978.]

80A-0557

GROUND-WATER POLLUTION BY TRANSFER OF OIL HYDROCARBONS

Fried, J.J., Muntzer, P. and Zilliox, L. 1979.

Ground Water 17(6):586-593.

Groundwater, Dispersion, Source identification, Hydrocarbons

An experiment to quantitatively measure pollution behavior in ground-water is described, with emphasis on the transfer of soluble substances from the oil into the ground water, and a quantitative definition of the pollution source.

D. FATE OF OIL IN THE ENVIRONMENT

3. Models, Simulations, and Predictions

80A-0558

AIDED BY COMPUTER, SCIENTISTS CONFRONT HUGE SPILL

Hill, G. 1979.

New York Times, August 28, 1979:C1.

Movement, Behavior, Drift, Oil slicks, Gulf of Mexico, Ixtoc I blowout, Environmental effects

A NOAA-USCG team is using a computer to analyze wind patterns, slick locations, and other data in order to help advise USCG on where to concentrate its cleanup efforts on the Campeche Bay oil spill, and to facilitate research and assess environmental impacts related to the spill.

[from Environment Abstracts 9(10): #79-05962. 1979.]

80A-0559

OIL SPILL SCENARIO FOR THE LABRADOR SEA

LeDrew, B.R. and K.A. Gustajtis. 1979.

Department of the Environment, Canada, Report EPS-3-EC-79-4. 675p.

Simulations, Blowouts, Labrador Sea, Canada, Baseline studies, Spill response, Contingency planning

"This study develops a scenario following a large oil spill from a blowout of an exploratory well in the Labrador Sea. Scenario development leads to the delineation of gaps in pertinent baseline information and serves to identify the applicability and inadequacies of available countermeasure techniques." [Abstracted separately in this issue of OPA are contributed chapters 8-12, and 14, by Northland Associates Ltd., T. Kierans et al., D. Thornton, J.R. Rossiter, Shaw Mont Newfoundland Ltd., and Centre for Cold Ocean Resources Engineering, respectively. See author index.]

80A-0560

THE PREDICTION OF OIL SLICK TRAJECTORIES AT THE HONOLULU HARBOR CHANNEL ENTRANCE

Lukas, R.B. 1978.

Reports of the Marine Institute of Geophysics, Report HIG-78-3. 182p.

Predictions, Oil slicks, Spill trajectories, Harbors, *Hawaii

Summary not available.

[from Marine Pollution Research Titles 5(10): #1714. 1978.]

D. FATE OF OIL IN THE ENVIRONMENT
3. Models, Simulations, and Predictions

80A-0561

MATHEMATICAL MODEL OF THE BEHAVIOUR OF OIL SPILLS ON WATER WITH NATURAL AND CHEMICAL DISPERSION

Mackay, D. 1977.

Canada Department of Fisheries and the Environment, Environmental Impact Directorate, Economic and Technical Review Report EPS-3-EC-77-19. 84p.

Models, Physical aspects, Behavior, Dispersion, Dispersants

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:17, #3608. 1979.]

80A-0562

OIL IN PACK ICE COLDROOM TESTS APOA PROJECT 149

Metge, M. 1978.

Calgary, Alberta, Imperial Oil Limited, Report No. IPRT-16ME-78. 30p.

Fate, Behavior, Ice, Simulations, Oil industry, *Pack ice, *APOA

Summary not available.

[from Marine Pollution Research Titles 6(10): #1834. 1979.]

80A-0563

OIL SPILL DRIFT PREDICTION MODEL

Noll, C.J., P.C. Cornillon and M.L. Spaulding. 1977.

University of Rhode Island, Department of Ocean Engineering. 33p.

Predictions, Drift, Behavior, Oil spills

Summary not available.

[from Marine Pollution Research Titles (6(10): #1840. 1979.)]

80A-0564

MODELING METHODS FOR PREDICTING OIL SPILL MOVEMENT

Oceanographic Institute of Washington. 1977.

Seattle, Oceanographic Institute of Washington, 1977. 102p.

Predictions, Movement, Spill trajectories

Summary not available.

[from Marine Pollution Research Titles 5(10): #1719. 1978.]

D. FATE OF OIL IN THE ENVIRONMENT
3. Models, Simulations, and Predictions

80A-0565

PREDICTED OIL-ICE INTERACTION FOR A HYPOTHETICAL BLOWOUT IN THE
LABRADOR SEA

Rossiter, J.R. 1979.

Oil Spill Scenario for the Labrador Sea. B.R. LeDrew and K.A. Gustajtis.
Department of the Environment, Canada, Report EPS-3-EC-79-4. p.347-362.
Chapter 11.

Predictions, Blowouts, Physical aspects, Ice, Labrador Sea, Canada

Discussed are the most probable ways in which oil from a subsea blowout, rising to the surface, might interact with the types of ice to be expected in the Labrador Sea. Considered are interactions within and outside of the wave ring at the surface of the blowout. Any spill cleanup measures must take into consideration the tremendous mobility of Labrador pack ice which might be oiled from such a blowout.

80A-0566

AN OILSPILL RISK ANALYSIS FOR THE WESTERN GULF OF ALASKA (KODIAK ISLAND)
OUTER CONTINENTAL SHELF LEASE AREA

Slade, J.R., R.A. Smith and T. Wyant. 1977.

U.S. Department of the Interior. 55p.

Risk analysis, Oil spills, Gulf of Alaska, OCS, Oil-gas leasing

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:18, #3618. 1979]

80A-0567

EXPERIMENTAL OIL SPILL: OIL IN ARCTIC COASTAL ENVIRONMENTS

Thornton, D.E. 1979.

Spill Technology Newsletter 4(6):325-327.

Coastal waters, Environmental effects, Shorelines, Dispersants, Arctic,
*Experimental spills

A program of experimental oil spills is announced. The objectives of this program are to determine if the use of dispersants in arctic coastal waters will reduce or increase the environmental effects of spilled oil, and to evaluate the relative effectiveness and environmental impact of other shoreline protection and cleanup techniques.

D. FATE OF OIL IN THE ENVIRONMENT

3. Models, Simulations, and Predictions

80A-0568

SEDIMENTARY MODEL PREDICTION OF HIGH-PRESSURE SHALES AND OIL SPILL
POTENTIAL ON ATLANTIC OUTER CONTINENTAL SHELF

Travers, W.B. 1977.

American Association of Petroleum Geologists Bulletin 61(5):836. Abstract.

Predictions, Sediments, Oil spills, Risk analysis, Atlantic coast, OCS,
Santa Barbara Channel

"Sedimentary modeling of the U.S. Atlantic Outer Continental Shelf (OCS)
versus the Gulf of Mexico and the Santa Barbara region of California
suggests that oil spills will not occur during drilling through unexpected
high pressure shales.... A Santa Barbara-type oil spill is virtually
impossible along the U.S. Atlantic Coast."

80A-0569

"OILSIM" A COMPUTER MODEL FOR SIMULATING THE BEHAVIOUR OF OIL SPILLS

Westeng, A. 1977.

POAC '77. D.B. Muggeridge (ed.). St. John's, Newfoundland, Memorial
University of Newfoundland, 1977. Vol 2:856-871.

Simulations, Models, Behavior, Spill trajectories

Summary not available.

[from Underwater Information Bulletin 10(5): #7810/1371. 1978.]

80A-0570

POLLUTION OF UNDERGROUND WATERS BY PETROLEUM PRODUCTS [IN FRENCH]

Zilliox, L., P. Muntzer and C. Gatellier. 1978.

Bulletin du Bureau de Recherches Geologiques et Minieres, Series 2,
Section 3,(4):317-326.

Contamination, Groundwater, Petroleum products

This is an account of current research at the Institute of Fluid
Mechanics of Strasbourg and at the French Oil Institute. A discussion
of oil penetration into the soil is detailed, and an experiment on a
porous medium which has brought about a new model of the source on the
contaminated area is discussed.

[from Petroleum Abstracts 20(11): #273,875. 1980.]

D. FATE OF OIL IN THE ENVIRONMENT

4. General Fate of Oil

80A-0571

NATURAL HYDROCARBON SEEPS COMMON IN HISTORY OF GULF

Anon. 1979.

Petroleum Engineering 51(10):10,12,14.

Natural Seepage, Hydrocarbons, Tar, Sampling, Chemical analysis, Gulf of Mexico

A study by Texas A & M University indicates that hydrocarbon seepage is occurring in the Gulf of Mexico and elsewhere in the world without serious damage to the marine environment. Several general areas of seepage within and around the Gulf of Mexico were located, with tar samples being collected and chemically analyzed.

[from Petroleum Abstracts 20(16): #274,896. 1980.]

80A-0572

FATE AND EFFECTS OF POLYNUCLEAR AROMATIC HYDROCARBONS IN THE AQUATIC ENVIRONMENT

American Petroleum Institute. 1978.

API Publication No. 4297. — p.

PAH, Aquatic environment, Hydrocarbons, Analytical techniques, Concentrations, Toxicity, Fate

"This report presents new insights into the significance of polynuclear aromatic hydrocarbons (PNAs) in the environment, based upon results from recently developed, highly diagnostic analytical methodologies for such components. Concentrations of specific compounds in various environments are revealed and related to probable sources. Data on solubilities, toxicities and fates of various PNAs are presented and discussed.
[possibly oil pollution related]

[from API Publications and Materials 1979. p.109, #841-42970. 1979.]

80A-0573

FATE AND EFFECTS OF OIL POLLUTANTS IN EXTREMELY COLD MARINE ENVIRONMENTS

Atlas, R.M. 1977.

University of Louisville, Department of Biology, Annual Report No. 5. 52p.

Physical effects, Environmental effects, Fate, Marine Environment, Subarctic regions, Cold climates

Summary not available.

[from Marine Pollution Research Titles 5(10): #1700. 1978.]

D. FATE OF OIL IN THE ENVIRONMENT
4. General Fate of Oil

80A-0574

FATE OF OIL SPILLS ON THE NORWEGIAN CONTINENTAL SHELF

Audunson, T., P. Steinbakke and F. Krogh. 1979.

Trondheim, Norway, Continental Shelf Institute, 1979. 37p.

Oil spills, OCS, Norway, Fate, Behavior

Summary not available.

[from Marine Pollution Research Titles 6(7): #1191. 1979.]

80A-0575

THE FATE AND WEATHERING OF SURFACE OIL FROM THE BRAVO BLOWOUT

Audunson, T. 1979.

Trondheim, Norway, Continental Shelf Institute, 1979. 30p.

Oil slicks, Weathering, Fate, Crude oil, Ekofisk blowout, North Sea

Summary not available.

[from Marine Pollution Research Titles 6(7): #1190. 1979.]

80A-0576

CONTAMINANTS AND SEDIMENTS. VOLUME 1-FATE AND TRANSPORT, CASE STUDIES, MODELING, TOXICITY

Baker, R.A.(ed.). 1980.

Ann Arbor, Michigan, Ann Arbor Science Publishers Inc., 1980. 650p.

Fate, Contamination, Hydrocarbons, Sediments, Argo Merchant spill, Models, Toxicity

This two-volume treatise represents an inter-disciplinary approach to defining the complex relationships involving sediments and contaminants in aqueous systems. Fundamental processes, field applications, regulatory aspects and toxicological considerations are defined and discussed. The section on Fate and Transport includes a discussion of hydrocarbons in contemporary aquatic sediments; case studies include the Argo Merchant spill and sediments of Nantucket Shoals; and the Modeling and Toxicity sections are relevant in part to oil pollution.

[from Ann Arbor Science Publishers' Science Previews, Spring 1980. p.5.]

80A-0577

OIL AND ITS EVOLUTION AFTER AN ACCIDENTAL OFFSHORE SPILL [ENGLISH SUMMARY]

Bocard, C., C. Gatellier and P. Renault. 1978.

Revue de l'Institut Francais du Petrole 33(3):349-366.

Fate, Behavior, Offshore

Summary not available.

[from Marine Pollution Research Titles 6(7): #1195. 1979.]

D. FATE OF OIL IN THE ENVIRONMENT

4. General Fate of Oil

80A-0578

MARINE POLLUTION: HOW BIG A PROBLEM (INPUTS AND FATE OF PETROLEUM TO THE MARINE ENVIRONMENT)

Butler, J.N. 1978.

Conference on Oil Tanker Transportation: An Interdisciplinary Analysis of National and International Policy and Practice, Georgetown, South Carolina, 8-10 November 1978. 13p.

Hydrocarbons, Fate, Dispersion, Seawater, Sediments, Marine environment

This paper reviews the inputs and fate of petroleum hydrocarbons into the marine environment and concludes that "the input of petroleum hydrocarbons to the world oceans is probably not much different than it was five years ago, except for an increase in tanker accidents. Evidence... indicates that it disperses from the surface within a year. It is not destroyed but migrates to the water column and sediments, where its residence time is much longer and degradation, if it occurs at all, is slow.

80A-0579

SUBMARINE SEEPAGE OF NATURAL GAS IN NORTON SOUND, ALASKA

Cline, J.D. and M.L. Holmes. 1977.

NOAA Outer Continental Shelf Environmental Assessment Program. Vol.XIII. Contaminant Baselines. p.269-289.

Fate, Natural seepage, Hydrocarbons, Alaska

Summary not available. [possibly oil pollution related]

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:2, #3465. 1979.]

80A-0580

INVESTIGATION OF FACTORS AFFECTING THE FATE OF NORTH SEA OILS DISCHARGED AT SEA. PART 1: EKOFISK CRUDE OIL. JULY 1975-FEBRUARY 1978.

Cormack, D., J.A. Nichols and B. Lynch. 1978.

Warren Spring Laboratory, Report No. LR273 (OP). 17p.

Fate, Behavior, Crude oil, Oil discharges, Offshore, Production, Oil fields, North Sea, *Ekofisk area

Summary not available.

[from Marine Pollution Research Titles 5(11): #1897. 1978.]

80A-0581

INVESTIGATION OF FACTORS AFFECTING THE FATE OF NORTH SEA OILS DISCHARGED AT SEA. PART 2: THE EKOFISK BLOWOUT APRIL/MAY 1977.

Cormack, D., and J.A. Nichols. 1978.

Warren Spring Laboratory, Report No. LR272(OP). 8p.

D. FATE OF OIL IN THE ENVIRONMENT

4. General Fate of Oil

Fate, Behavior, Crude oil, Oil discharges, Blowouts, Ekofisk blowout, North Sea, Offshore

Summary not available.

[from Marine Pollution Research Titles 5(11): #1896. 1978]

80A-0582

OIL ON THE WATER

Eastman Kodak Co. 1978?

Rochester, New York, Eastman Kodak Co., 1978? 1p.

Fate, Behavior, Physical aspects, Remote sensing

Summary not available. [Available from Eastman Kodak Co., Rochester, New York 14650.]

[from RESORS, Canada Centre for Remote Sensing Database: #1019781. 1980]

80A-0583

NATURAL HYDROCARBON SEEPS

Geyer, R.A. 1979.

Ecolibrium 8(4):7-10.

Natural seepage, Distribution, Concentrations, Hydrocarbons, Mollusks, Environmental effects, Gulf of Mexico

Recent investigations have found that naturally occurring hydrocarbons are present in significant amounts in the marine environment. A possible positive aspect of this is that water containing high levels of hydrocarbons also contain large amounts of bacteria, which serve as food sources for shellfish. It is concluded that marine pollution by petroleum hydrocarbons appears to be less of a problem than originally projected.

[from Environment Abstracts 10(1): #80-00374. 1980]

80A-0584

NATURALLY OCCURRING HYDROCARBON SEEPS IN THE GULF OF MEXICO AND THE CARIBBEAN SEA

Geyer, R.A. 1979.

Texas A & M University, Department of Oceanography, Report NOAA-79083004, NTIS Report PB-301-376. 20p.

Natural seepage, Biological effects, Fate, Hydrocarbons, Gulf of Mexico, Caribbean Sea

"Historical and present data indicate that major crude oil seepage has been, and is occurring in the Gulf of Mexico along the Texas Gulf Coast and the coast of Mexico. Results of biological and geological investigations are summarized which indicate that "persistent introduction of hydrocarbons over thousands of years into an ecosystem has not been deleterious to the marine environment."

D. FATE OF OIL IN THE ENVIRONMENT

4. General Fate of Oil

80A-0585

COMPREHENSIVE STUDY OF PETROLEUM HYDROCARBONS IN THE MARINE ENVIRONMENT
AT LONG COVE, SEARSPORT, MAINE

Gilfillan, E.S., S.A. Hanson, D.S. Page, et. al. 1977.

West Boothbay Harbor, Maine, Bigelow Laboratory for Ocean Sciences,
1977. 192p.

Hydrocarbons, Coastal waters, Environmental effects, Chronic effects,
Ports, Maine

Summary not available.

[from Marine Pollution Research Titles 5(10): #1710. 1978.]

80A-0586

THE EKOFISK BRAVO BLOWOUT: FATE OF THE FLOATING OIL

Grahl-Nielsen, O., K. Westrheim and S. Wilhelmsen. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap. Rep.,
Report No. C.M. 1977/E:55. p.4:1-4:6.

Ekofisk blowout, North Sea, Fate, Behavior, Oil slicks, Movement

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder
and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979.
Supplement 3:22, #3761. 1979.]

80A-0587

ESTUARINE INTERACTIONS (POLYNUCLEAR AROMATIC HYDROCARBONS IN ESTUARINE
AND NEARSHORE ENVIRONMENTS)

Jackim, E. and C. Lake. 1978

Estuarine Interactions. M.L. Wiley (ed.). New York, Academic Press,
1978. p.415-428. Proceedings of the Fourth International Estuarine
Research Conference, Mt. Pocono, Pennsylvania, 2-5 October 1977.

PAH, Estuaries, Coastal waters, Uptake, Biodegradation, Metabolism,
Oxidation

Chemical and physical properties of PAHs are reviewed. Bivalves are
most susceptible to PAH uptake in aquatic environments. The primary
source of degradation of PAHs in the marine environment is through
biological metabolism and chemical oxidation.

[from Environment Abstracts 9(7): #79-03742. 1979.]

D. FATE OF OIL IN THE ENVIRONMENT

4. General Fate of Oil

80A-0588

FATE AND WEATHERING OF PETROLEUM SPILLS IN THE MARINE ENVIRONMENT:
A LITERATURE REVIEW AND SYNOPSIS

Jordan, R.E. and J.R. Payne. 1980.

Ann Arbor, Michigan, Ann Arbor Science Publishers Inc., 1980. 170p.

Physical aspects, Weathering, Chemical effects, Biodegradation, Behavior, Fate, Petroleum products, Marine environment

"Here is an important new technical reference that covers all relevant aspects of petroleum weathering in the marine environment. Delineates research areas that are lacking in depth, and suggests areas for future research." The following topics are covered: Abiotic factors/processes; microbial degradation, physical and environmental interactions of spilled oil; properties and types of crude oils and petroleum products, and approaches to mass balance problems. Nearly 250 references are included.

[from Ann Arbor Science Publishers Science Previews, Spring 1980. p.14.]

80A-0589

FATE OF OIL IN THE SEA

Lee, R.F. 1977.

Proceedings of the 1977 Oil Spill Response Workshop. P.L. Fore (ed.). U.S. Fish and Wildlife Service, Report FWS/OBS/77-22, NTIS Report PB-282 375. p.43-54.

Oil spills, Sea surface, Dispersion, Weathering, Fate, Biodegradation, Sedimentation, Microorganisms

In the sea, oil fractions that do not evaporate are affected by emulsification and dispersion, dissolution, photooxidation, adsorption to suspended particles, biodegradation, and uptake by marine organisms. Oil that has been absorbed to sediment particles and sinks to the sea floor is affected by microbes and by benthic meiofauna and macrofauna, which absorb and metabolize the hydrocarbon fractions.

80A-0590

OIL IN THE SEA

McIntyre, A.D. 1979.

Scottish Fisheries Bulletin, Vol.45:37-41.

Oil spills, Marine environment, Environmental effects

Summary not available.

[from Marine Pollution Research Titles 6(10): #1831. 1979.]

D. FATE OF OIL IN THE ENVIRONMENT

4. General Fate of Oil

80A-0591

PESTICIDE AND XENOBIOTIC METABOLISM IN AQUATIC ORGANISMS (DISPOSITION AND METABOLISM OF AROMATIC HYDROCARBONS IN MARINE ORGANISMS)

Malins, D.C., et al. 1979.

American Chemical Society Symposium Series, No.99:57-76.

Aromatic hydrocarbons, Metabolism, Marine organisms, Fate, Uptake

Studies to determine the fate of hydrocarbons in marine organisms are reviewed. Typical methods of exposure are listed, and conditions affecting the rate of hydrocarbon uptake in various marine organisms are described.

[from Environment Abstracts 9(9): #79-05067. 1979.]

80A-0592

PROBABLE BEHAVIOR AND FATE OF A WINTER OIL SPILL IN THE BEAUFORT SEA
Norcor Engineering and Research Limited. 1977.

Canada Department of Fisheries and the Environment, Environmental Impact Control Directorate, Technology Development Report EPS-4-EC-77-5. 111p.

Physical aspects, Fate, Behavior, Oil spills, Cold climates, Ice, Arctic, Beaufort Sea

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:8, #3528. 1979.]

80A-0593

A PROPOSED STUDY OF OIL AND GAS UNDER ICE

Pistruzak, W.M. 1979.

Spill Technology Newsletter 4(5):304-313.

Behavior, Fate, Ice, Arctic, Burning, Equipment, Performance testing

The proposed study has the following main goals: Understanding the behavior of oil in and under ice; understanding how oil accumulates on melting ice; to learn, if possible, the optimum time for burning of oil contained on melt pools so that environmental damage can be minimized; devise and test under realistic conditions devices which can ignite the oil; and measure how the oil is burned, how much remains, and the chemical nature of residual oils.

D. FATE OF OIL IN THE ENVIRONMENT

4. General Fate of Oil

80A-0594

THE COMPOSITION OF PETROLEUM

Posthuma, J. 1977.

Rapport et Proces - Verbaux des Reunions Conseil Permanent International pour l'Exploration de la Mer, Vol.171:7-16.

Crude oil, Chemical analysis, Biodegradation, Weathering, *Composition

This paper discusses the origin and composition of petroleum. Briefly discussed are biodegradation and weathering. [possibly oil pollution related.]

80A-0595

NATURAL TAR SEEPS AND ASPHALT DEPOSITS OF SANTA BARBARA COUNTY

Priestaf, I. 1979.

California Geology 32(8):163-169.

Natural seepage, Tar, Santa Barbara Channel, California, Offshore, Onshore, *Asphalt deposits

Described are the nearshore and onshore asphalt deposits and natural oil seeps at More Mesa and in Carpinteria, California. Although the onshore tar seeps do not contribute significantly to pollution, they "afford accessible examples of natural seeps comparable to those that are sources of significant marine pollution."

80A-0596

BUZZARDS BAY OIL SPILL - AN ARCTIC ANALOGUE

Ruby, C.H., L.G. Ward, I.A. Fischer and P.J. Brown. 1977.

4th International Conference on Port and Ocean Engineering under Arctic Conditions, St. John's, Newfoundland, 26 September 1977. St. John's, Newfoundland, Memorial University of Newfoundland, Ocean Engineering Information Centre, 1977. —p.

Oil spills, Buzzards Bay, Arctic, *Comparison study

Summary not available.

[from Marine Pollution Research Titles 6(7): #1262. 1979.]

80A-0597

OIL SPILL VULNERABILITY INDEX, COPPER RIVER DELTA

Ruby, C.H. and M.O. Hayes. 1978.

Coastal Zone '78 Symposium on Technical, Environmental, Socio-Economic and Regulatory Aspects of Coastal Zone Management, San Francisco, 14-16 March 1978. New York, American Society of Civil Engineers, 1978. Vol.3 p.2204-2220.

Oil spills, Coasts, Rivers, Coastal zone management, *Vulnerability index

Summary not available.

[from Marine Pollution Research Titles 6(7): #1261. 1979.]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION

1. Biological Aspects

80A-0598

TOXICITY OF AN IN SITU OIL SHALE PROCESS WATER TO RAINBOW TROUT AND FATHEAD MINNOWS

Anderson, A.D., M.E. Lebsack, G.M. DeGraeve, D.S. Farrier and H.L. Bergman. 1980.

Archives of Environmental Contamination and Toxicology 9(2):171-180.

Oil shale, Extraction, Wastewaters, Toxicity, Fish, *Rainbow trout, *Fathead minnows

"An in situ oil shale process water, designated Omega-9 water, was used in flow-through bioassays with fathead minnows, rainbow trout and rainbow trout eggs. Of the two fish species, rainbow trout were more sensitive to acute exposure to Omega-9 water with 96-hour LC₅₀ dilutions of 0.51% and 0.41% in two independent determinations. In embryo-larval studies, the length of fry from eggs hatched and maintained in 0.16% process water was significantly less than that of eggs hatched in control water."

80A-0599

BIOASSAY OF COMPLEX MIXTURES DERIVED FROM FOSSIL FUELS

Bingham, E. and W. Barkley. 1979.

Environmental Health Perspectives 30 (June):157-163.

Bioassay, Oil shale, Crude oil, Fossil fuels, Carcinogens, Health hazards, Aromatic hydrocarbons, *PNA

Processing or conversion of shale, coal, or petroleum involves conditions under which polynuclear aromatic hydrocarbons (PNAs) are formed. Certain PNAs exhibit carcinogenic activity for a variety of organ sites in animals and epidemiological evidence strongly implicates their role as carcinogens in man. The experiments reported in this article present experience with several complex PNA mixtures derived from shale and crude oil and compare their relative carcinogenic potency in a bioassay system.

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
1. Biological Aspects

80A-0600

CARCINOGENICITY OF OIL SHALE TARS, SOME OF THEIR COMPONENTS, AND
COMMERCIAL PRODUCTS

Bogovski, P.A. and F. Vinkmann. 1979.

Environmental Health Perspectives 30 (June):165-169.

Petroleum products, Tar, Oil shale, Crude oil, Carcinogens, Health hazards, USSR, *Benzo(a)pyrene, *Estonia

This article summarizes the results of nearly 3 decades of research on the carcinogenicity of various primary processing products (crude oils or tars) from Estonian oil shale. Although there is no strict correlation between the concentration of benzo(a)pyrene (PB) in oil shale products and their degree of carcinogenicity, the "determination of benzo(a)pyrene in such products can serve as an approximate estimate of carcinogenic properties."

80A-0601

COCARCINOGENICITY OF PHENOLS FROM ESTONIAN SHALE TARS (OILS)

Bogovski, P.A. and H.I. Mirme. 1979.

Environmental Health Perspectives 30 (June):177-178.

Carcinogens, Health hazards, Oil shale, Tar, Wastewaters, Extraction, USSR, *Phenols, *Estonia

Various thermal processing products of Estonian oil shale and shale tars contain up to 40% by volume of phenols, which can be separated from the oil or recovered from process wastewaters. A number of these phenols possess a distinct carcinogenic action, as shown in a series of 2-stage experiments, which are detailed in this article.

80A-0602

MORBIDITY AND MORTALITY STUDY OF SHALE OIL WORKERS IN THE UNITED STATES

Costello, J. 1979.

Environmental Health Perspectives 30(June):205-208.

Oil shale, Health hazards, Mortality, Carcinogens, Extraction, Oil industry, US, *Shale oil workers

This paper reviews past work of Soviet and British investigators concerning potential health hazards of exposure to shale oil. The results and conclusions of a 1952-1955 dermatological study of oil shale workers by the US Public Health Service are discussed, and plans for a current mortality and morbidity study are detailed. [possibly oil pollution related]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
1. Biological Aspects

80A-0603

EVALUATION OF FEASIBILITY OF MUTAGENIC TESTING OF SHALE OIL PRODUCTS AND EFFLUENTS

Epler, J.L., T.K. Rao and M.R. Guerin. 1979.
Environmental Health Perspectives 30(June):179-184.

Mutagens, Health hazards, PAH, Wastewaters, Crude oil, Oil shale, Extraction

In the title study, the Ames Salmonella histidine-reversion system was evaluated for testing the mutagenic potential of crude shale oil, natural crude oil, and process wastewaters from oil shale processing. Mutagenicity data on isolated or suspected organic components are also presented. Chemical constituents that have been implicated as potentially hazardous include several polycyclic fused aromatic hydrocarbons and polycyclic fused heterocyclic hydrocarbons.

80A-0604

ALKANES IN BARNACLES (BALANUS TINTINNABULUM) FROM THE BUCCANEER OILFIELD

Middleditch, B.S., E.S. Chang and B. Basile. 1979.
Bulletin of Environmental Contamination and Toxicology 23 (1/2):6-12.

Platforms, Crustaceans, Uptake, Depuration, Hydrocarbons, Concentrations, Gulf of Mexico, *Barnacles, *Alkanes

The results of this study indicate that barnacles attached to the legs of petroleum production platforms and well jackets in the Buccaneer Oilfield ingest oil-derived alkanes when the oil concentration in the water is relatively high. However, the ingested alkanes may be excreted when the alkane concentration in the water is reduced.

80A-0605

CONCENTRATION-DEPENDENCE OF THE EFFECT OF AN IN SITU OIL SHALE RETORT-PRODUCED WATER ON METABOLISM

Nelson, K.F., D.S. North and D.S. Farrier. 1979.
Bulletin of Environmental Contamination and Toxicology 23(6):747-752.

Oil shale, Wastewaters, Extraction, Concentrations, Metabolism, Biological effects

Waste waters are produced during thermal retorting of oil shale to produce shale oil. Previous studies have indicated that Omega-9, a retort water, induced activity of liver enzymes. In this study, increased enzyme induction was found to be almost directly proportional to the concentration of Omega-9 waters.

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
1. Biological Aspects

80A-0606

THE EFFECT OF AN IN SITU-PRODUCED OIL SHALE PROCESSING WATER ON METABOLISM

Nelson, K.F., D.S. North, G.R. Payne, A.D. Anderson, et al. 1978.
Archives of Environmental Contamination and Toxicology 7(3):273-282.

Oil shale, Production, Extraction, Wastewaters, Toxicity, Metabolism, Mammals, *Rats

The effects of in situ-produced oil shale retort water on the metabolism of rats was studied both in vivo and in vitro. "The induction observed in rats was classified as Type I due to an increase in metabolism of hexobarbital and ethylmorphine without subsequent increases in zoxazolamine metabolism." Results obtained from this study will be of value in interpreting toxicological aspects of oil shale processing wastewaters. [possibly oil pollution related]

80A-0607

MUTAGENIC AND CARCINOGENIC PROPERTIES OF POLYCYCLIC AROMATIC HYDROCARBONS

Pashin, Y.V. and L.M. Bakhitova. 1979.

Environmental Health Perspectives 30(June):185-189.

Carcinogens, Mutagens, Crude oil, PAH, Oil shale, Oil industry

Persons especially at risk occupationally are those engaged in thermal processing of heavy crude oil, oil shale and coal, as they are exposed to benzo(a)pyrene and other carcinogenic aromatic hydrocarbons. Polycyclic aromatic hydrocarbons require metabolic activation before they can act as mutagens or carcinogens. "Metabolites of the PAHs which are carcinogenic usually are mutagenic, which supports the hypothesis that damage to chromosomes plays an important part in carcinogenesis."

80A-0608

CANCER PATTERNS IN THE OIL SHALE AREA OF THE ESTONIAN S.S.R.

Purde, M. and M. Radu. 1979.

Environmental Health Perspectives 30 (June):209-210.

Oil shale, Carcinogens, Chronic effects, Extraction, Oil industry, USSR, *Cancer incidence, *Estonia

Excessively high rates of skin cancer were reported for women who had worked in the oil shale processing industry for 10-20 years, but "preliminary results show that stomach and lung cancer incidence rates do not differ significantly in oil shale workers and the general population of Estonia."

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION

1. Biological Aspects

80A-0609

EFFECTS OF CHEMICAL USE IN OFFSHORE WELL-DRILLING OPERATIONS

Richards, N.L. 1977.

Program Review Proceedings of Environmental Effects of Energy Related Activities on Marine/Estuarine Ecosystems. C. Hall and W. Preston (eds.). Report EPA/600/7-77/111. p.161-174.

Offshore, Platforms, Drilling, Environmental effects, Marine organisms, Coral reefs, Fisheries, *Drilling muds

Existing data on the title topic are very limited. This paper discusses a research program on drilling fluid constituents initiated at the EPA Gulf Breeze Laboratory, Florida, which is addressing the following topics of concern: 1.) The distance that rigs must be from coral reefs to minimize effects from drilling mud emissions; 2.) effects of mud on resident rig marine life; 3.) advisability of aquaculture near platforms; and 4.) recommended distance from rigs for seafood harvesting.

80A-0610

POTENTIAL TOXIC EFFECTS ON AQUATIC BIOTA FROM OIL SHALE DEVELOPMENT

Skogerboe, R.K., D.F.S. Natusch, D.R. Taylor and D.L. Dick. 1978. Eleventh Oil Shale Symposium Proceedings. J.H.Gary (ed.). Golden, Colorado, Colorado School of Mines, 1978. p.43-47.

Toxicity, Oil shale, Extraction, Wastewaters, Water quality, Chemical analysis, Chemical effects

Reviewed is a research program which has the following primary objectives: (1) to establish the extent to which oil shale development effluents can contaminate the aquatic system; (2) to characterize chemical constituents in the effluents, (3) to identify the principal toxicants present in the effluents with emphasis on the aquatic biota; and (4) to determine the transformation and transport behavior of the toxic entities.

80A-0611

WILDLIFE MITIGATIVE MEASURES FOR OIL AND GAS ACTIVITY IN ALBERTA

Stubbs, C.W.B. and B.J. Markham. 1979.

American Fisheries Society/et al. Mitigation Symposium, Fort Collins, Colorado, 16-20 July 1979. p.264-270.

Biological effects, Onshore, Fish, Wildlife, Development, Canada, *Alberta

Mitigation of impacts on fish and wildlife, due to oil and gas activity in Alberta is described. The impact of oil and gas related activities, and the resultant increase in public access are two of the impacts considered.

[from Environment Abstracts 10(1): #80-00346. 1980]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION

1. Biological Aspects

80A-0612

TOXICITY OF DRILLING-MUD BIOCIDES TO DEVELOPING ESTUARINE MACRO-BENTHIC COMMUNITIES

Tagatz, M.E., J.M. Ivey and J.L. Oglesby. 1979.

Northeast Gulf Science 3(2):87-95.

Biological effects, Toxicity, Offshore, Drilling, Estuaries, Benthos, Marine organisms, *Biocides

The effects of the biocides Surflo-B33, and Aldacide, used in offshore oil drilling operations, were determined by comparing macro-benthic communities that developed from planktonic larvae in treated and untreated aquaria. Surflo-B33 had effects similar to those of penta-chlorophenol, a biocide known to be toxic to many marine organisms, especially mollusks. Aldecide, consisting of 91% paraformaldehyde was far less toxic, and its use is recommended.

80A-0613

TOXICOLOGICAL STUDIES OF SHALE OILS, SOME OF THEIR COMPONENTS, AND COMMERCIAL PRODUCTS

Veldre, I.A. and H.J. Jänes. 1979.

Environmental Health Perspectives 30(June):141-146.

Oil shale, Petroleum products, Toxicity, Health hazards, Chronic effects, Animals, USSR, *Phenols, *Estonia

Estonian shale oil contains about 25-30% phenols; it is their action and chemical properties which determine the toxicity of the shale oil and its derived commercial products. This article details toxicological aspects of the water soluble oil shale phenols, and the health hazards they present.

2. Physical and Chemical Aspects

80A-0614

SOURCES AND CHARACTERISTICS OF LIQUID PROCESS WATER FROM ARCTIC OFFSHORE HYDROCARBON EXPLORATION

Hrudey, S.E. and P. Eng. 1979.

Arctic 32(1):3-21.

Chemical analysis, Chemical effects, Toxicity, Drilling, Offshore, Arctic, Exploration, Wastewater disposal, Canada, *Drilling muds

Possible sources of process liquid wastes from exploratory offshore drilling are identified and quantified, and their chemical and toxicological properties are described. "Close process control to reduce the quantities of waste fluid generated and judicious selection of drilling mud additives should prevent the occurrence of significant water pollution problems from waste fluid disposal at exploratory Arctic offshore drilling operations."

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
2. Physical and Chemical Aspects

80A-0615

CHEMISTRY OF MARINE PETROLEUM SEEPS IN RELATION TO EXPLORATION AND POLLUTION

Kaplan, I.R. and W.E. Reed. 1977.

Offshore Technology Conference, 9th, Houston, 2-5 May 1977. Vol. III: 425-434. Paper OTC 2933.

Chemical analysis, Natural seepage, Exploration, Marine environment

"Chemical properties of submarine petroleum seeps off the Southern California borderland have been studied in relation to crude oil produced in the same geographic area, the compositional changes due to weathering in the marine environment, and the hydrocarbon and trace element compositions of the surrounding sea water and adjacent sediments." The content of nitrogen and sulfur, their isotopic ratios, and the carbon isotope ratios of different chromatographic fractions are useful in distinguishing oils and seeps from different formations.

80A-0616

POSSIBLE ACCUMULATION OF HEAVY METALS AROUND OFFSHORE OIL PRODUCTION FACILITIES IN THE BEAUFORT SEA

Newbury, T.K. 1979.

Arctic 32(1):42-45.

Sediments, Sedimentation, Offshore, Production, Marine organisms, Uptake, Metabolism, Food web, *Heavy metals

The heavy metals chromium, zinc, cadmium and lead have accumulated in the sediments around some offshore oil rigs. Oil production is now being considered for some nearshore sections of the Beaufort Sea coast. During winter in the Beaufort Sea, heavy metals in the sediments will not be dispersed; the under-ice currents are slow, and some of the bottom is covered by very saline, relatively stagnant water. Heavy metals in the sediments can probably be assimilated by epibenthic animals in the nearshore region, and then transferred through the food chain to natives who partially subsist on marine animals.

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
2. Physical and Chemical Aspects

80A-0617

DETERMINATION OF HYDROCARBONS IN WATER BY USING A FLAME IONISATION DETECTOR

Takeda, T. and Umino, M. 1977.
Bunseki Kagaku 26(5):357-359.

Wastewaters, Detection, Hydrocarbons, *Ionization

"Total hydrocarbons in drainage water were determined by injecting the sample into an evaporation unit, and passing the vapour through a heated, empty, stainless-steel tube to the flame ionisation detector. The detector response was recorded as a peak."

[from Fuel and Energy Abstracts 19(4):359, #24-0139. 1978]

3. Social and Economic Aspects

80A-0618

EFFECTS OF OILFIELD BRINES, USED CRANKCASE OIL, AND REFINERY WASTEWATERS ON BEER QUALITY AND TOURISM

Kcepsnerhe, H. 1980.
Bayrische Brauerei und Sauerei 6(4):43-80.

Waste oil, Oil fields, Refineries, Wastewaters, Reuse, Water quality, Socioeconomic effects, *Bavaria, *Beer, *Tourism

The reuse of oilfield brines, waste crankcase oils and refinery wastes has been suggested as a means of giving beer more "body". Although it has been shown that the resulting beer would have a rich and pleasing color, research shows that such a brew would have little or no "head", a suspicious odor, and a taint reminiscent of some generic US beers. Little consumer acceptance could be expected, and the effects on tourism and the Bavarian economy could be disastrous. The author, in a passionate polemic, strongly discourages implementation of such a scheme to use ersatz ingredients.

[from Bavarian Academy of Sciences 43(6):4. 1980]

80A-0619

ECONOMIC IMPACT OF THE EFFECTS OF POLLUTION IN THE COASTAL FISHERIES IN THE ATLANTIC AND GULF OF MEXICO REGIONS OF THE UNITED STATES OF AMERICA

Kumpf, H.E. 1977.
FAO Fisheries Technical Report, No.172:86p.

Economic effects, Offshore, Exploration, Production, Atlantic Coast, Gulf of Mexico, Water quality

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
3. Social and Economic Aspects

The economic impacts of pollution on the Atlantic and Gulf of Mexico fisheries was evaluated. Aspects of pollution such as oil and gas exploration and production were examined in terms of economic objectivity. Large-scale fish kills caused by pollution and water quality degradation caused the highest dollar losses.

[from Environment Abstracts 9(7): #79-03844. 1979]

80A-0620

SOME TECHNICAL AND ECONOMIC CONSIDERATIONS RELATING TO THE SAFETY OF OFFSHORE DRILLING OPERATIONS IN FRONTIER AREAS

Potts, H.L. 1979.

Spill Technology Newsletter 4(5):280-287.

Economics, Socioeconomic effects, Offshore, Exploration, Drilling, Canada

Discussed are several technical, economic and political factors which bear directly on offshore drilling technology which in turn may influence the philosophy of planning oil spill countermeasures. This article addresses problems associated with drilling in deepsea frontier areas of Canada, and makes some suggestions for developing new procedures and hardware.

4. Legal and Regulatory Aspects

80A-0621

REPORT SEEKS FASTER ACTION IN OIL DRILLING [NEWS BRIEF]

Anon. 1980.

National Fisherman 60(12):2.

Legislation, Oil-gas leasing, Offshore, Atlantic coast

Chairman of the House Merchant Marine and Fisheries Committee, U.S. Rep. John Murphy (D-N.Y.), has issued a report calling for the acceleration of the offshore oil leasing and drilling process. Murphy seeks to eliminate delays in oil drilling caused by lawsuits brought by fishermen and environmental groups who complain that the environment is not being adequately protected.

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
4. Legal and Regulatory Aspects

80A-0622

OIL SPILLS: CONVENTION TO LIMIT LIABILITY

Fleischer, C.A. 1977.

Environmental Policy and Law 3(2):76-78, 93-95.

International conventions, Liability, Offshore, Exploration, Regulations, Oil industry

The Intergovernmental Convention on Civil Liability for oil spills, [London, 20-31 October 1975, and 13-17 December 1976] was held not only to ensure adequate compensation for parties who suffered pollution damage caused by offshore oil exploration, but also to adopt uniform rules and procedures for limiting the liability of operators and the oil industry.

80A-0623

REGULATION OF NORTH SEA MARINE POLLUTION

Fotheringham, P. and P.W. Birnie. 1979.

Pinter: The Effective Management of Resources - the International Politics of the North Sea, 1979. p.168-225.

International agreements, Regulations, Offshore, Production, North Sea, Ekofisk blowout, Amoco Cadiz spill

The international political processes involved in the regulation of pollution and of oil and gas production are discussed. The Ekofisk blowout and the stranding of the Amoco Cadiz oil tanker are viewed so as to assess the effectiveness of various global and legal administrations established to control marine pollution in the North Sea.

[from Environment Abstracts 9(9): #79-05221. 1979]

80A-0624

THE FISHERY CONSERVATION AND MANAGEMENT ACT AS A TOOL FOR MITIGATION IN OUTER CONTINENTAL SHELF PETROLEUM DEVELOPMENT

Rieser, A. and J. Spiller. 1979.

American Fisheries Society/et al. Mitigation Symposium, Fort Collins, Colorado, 16-20 July 1979. p.653-675.

Fisheries, Resource management, OCS, Development, Atlantic coast, Georges Bank, Drilling, Habitats

Oil spills, pipeline beaches, and daily operational discharges and runoff drainage from drilling rigs and platforms are a threat to the productivity of Georges Bank fisheries. Current and proposed legislation is viewed as inadequate to protect critical fishery habitats on the Georges Bank. The adverse effects of petroleum drilling activities on fisheries in this area could be minimized by incorporating critical fishery habitats into a regional fishery management plan.

[from Environment Abstracts 10(1):80-00411. 1980]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
4. Legal and Regulatory Aspects

80A-0625

NEPA STRIVES FOR EQUAL BALANCE

Sethi, V.K. 1977.

Offshore 37(13):200,202,205-206.

Oil industry, EIS, Offshore, OCS, Pollution control, Legislation, US

"The main thrust of the National Environmental Policy Act (NEPA) passed in January 1970 relates to environmental considerations strongly affecting the oil and gas industry and construction-related projects in all sections of the U.S. environmental impact statements (EIS). Worldwide offshore oil pollution control efforts are briefly noted."

[from Oceanic Abstracts 15(4): #78-05400. 1978]

80A-0626

COASTAL IMPACT MITIGATION AND OCS-INDUCED OIL AND GAS DEVELOPMENT:
A PERSPECTIVE OF THE CLEAN WATER ACT'S SECTION 404 GUIDELINES

Terrell, C.R. and L.R. Shanks. 1979.

American Fisheries Society/et al. Mitigation Symposium, Fort Collins, Colorado, 16-20 July 1979. p.270-276.

Legislation, OCS, Offshore, Development, Environmental effects, Guidelines, Pollution control

Current and proposed oil and gas industry projects and activities which are in need of careful environmental planning are discussed. Section 404 of the Federal Water Pollution Control Act of 1977 sets forth guidelines which have an impact on coastal impact mitigation efforts.

[from Environment Abstracts 10(1): #80-00408. 1980]

80A-0627

ENVIRONMENTAL CONSIDERATIONS IN FEDERAL OIL AND GAS LEASING ON
OUTER CONTINENTAL SHELF

Thomas, H. 1979.

Natural Resources Journal 19(2):399-410.

OCS, Oil-gas leasing, Legislation, Government agencies, US

The Outer Continental Shelf Lands Act of 1978 gives the secretary of USDI power to cancel OCS oil and gas leases for environmental reasons, and requires the secretary to conduct an environmental assessment study of areas involved in sales of oil and gas leases. The Court of Appeals interprets NEPA 69 to require a Federal agency to fully consider alternative operating orders and viable suggestions for project operations on OCS leases.

[from Environment Abstracts 9(9): #79-05204. 1979]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
5. General Aspects

80A-0628

ENVIRONMENTAL CONCERN BRINGS NEW KNOWLEDGE OF ALASKA BACK COUNTRY
Anon. 1979.

Alaska Construction and Oil 20(5):12-17.

Environmental effects, Oil industry, Wildlife, Habitats, Alaska

"Petroleum industry activities in Alaska have had some positive effects on Alaskan Wildlife." ...Knowledge about the Alaskan environment has been broadened by oil company studies. Engineers and environmentalists work together to produce plans that are economically and environmentally compatible. Habitat protection and revegetation by Husky Oil, the USGS contractor that oversees exploratory drilling on the National Reserve - Alaska, are detailed."

[from Environment Abstracts 9(8): #79-04462. 1979]

80A-0629

HOW IXTOC 1 WAS FINALLY KILLED

Anon. 1980.

Ocean Industry 15(4):12-13.

Offshore, Ixtoc 1 blowout, Drilling, Gulf of Mexico

In June 1979, Pemex's Ixtoc 1 had a blowout, the world's worst. An estimated 3.1 million bbl oil, and much gas were lost through the BOP stack which had to be moved. Because relief drilling was not very successful, high-volume pumps were used to kill the well. Once a pipe was run into the hole, sacks of cement and mud were inserted to form three plugs, 2,885' long in all. The operation took nearly 10 months to complete.

80A-0630

'HUMAN ERROR' IN BRAVO BLOWOUT

Anon. 1977.

Offshore Services 10(12):21,43.

Ekofisk blowout, North Sea, Government agencies, Norway

A special commission was established by the Norwegian Government to investigate the Bravo blowout on the Ekofisk field in the Norwegian Sector of the North Sea in April 1977. Damage to marine life was negligible, and oil slicks never reached North Sea shores. However, the commission's report may still lead to criminal charges against those responsible for the circumstances which resulted in the accident.

[from Oceanic Abstracts 15(4): #78-05309. 1978]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION

5. General Aspects

80A-0631

OCS BLOWOUT RECORD SEEN GOOD, BUT...

Anon. 1980.

Oil Gas Journal 78(12):207.

Offshore, OCS, Platforms, Blowouts, Production, Statistics

A study of OCS blowouts concludes there has been good well control for OCS operations but training and technological improvements could better the score. The study shows a total of 46 OCS blowouts, seventeen from exploratory drilling with mobile rigs, thirteen others from drilling on fixed platforms and the remaining sixteen occurred during production. Further discussion of the areas where improvements can be expected is presented.

[from Petroleum Abstracts 20(14): #274,372. 1980]

80A-0632

COOKING THE OIL OUT OF ROCK

Bailey, E. 1979.

Conservation News 44(9):10-12.

Oil shale, Extraction, Environmental effects, Vegetation

Oil-shale resources near Colorado may be tapped and developed on a large scale. The drawbacks include the disposal of wastes remaining on the surface. These may cause erosion and leaching of minerals from the shale, and destruction of natural vegetation. Air-quality would also decrease, unless processed shale can be revegetated.

80A-0633

OIL BEFORE OYSTERS

Baker, W.C. 1979.

Environmental Action 11(5):28-30.

Refineries, Environmental effects, Estuaries, Mollusks, Fisheries, Biological effects, Chesapeake Bay, *Oysters

An oil refinery may be developed in the Chesapeake Bay, the site of the nation's largest oyster industry. Fishermen fear that an oil spill is inevitable, and cleanup techniques inadequate. Concentrations of 0.1-1.0 ppm are lethal to larval stages in the estuary, and cause physiological alteration and carcinogenesis to lower organisms. From studying past oil spills in the Bay, it was ascertained that oil spills are much more damaging in an estuary than in the ocean.

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
5. General Aspects

80A-0634

DRILLING OFFSHORE: THE ENVIRONMENTAL HAZARDS

Chasis, S. 1979.

National Parks & Conservation Magazine 53(8):16-22.

Drilling, Environmental effects, Oil spills, Coasts, Onshore impacts, Socioeconomic effects

Potential threats to the environment from acceleration of offshore drilling operations are discussed. Implementation of the Outer Continental Shelf Lands Act of 1978 could minimize these threats. "Increased drilling activity could bring catastrophic oil spills and cause economic dislocation in coastal areas."

[from Environment Abstracts 9(10): #79-05946. 1979]

80A-0635

OIL INTERACTIONS WITH FISHERIES

Crutchfield, J.A., Jr. 1980.

Marine Sciences and Ocean Policy Symposium - A Definition of the Issues and a Search for a Consensus on Multiple Uses, University of California, Santa Barbara, June 1979. Santa Barbara, California, Committee for the Marine Sciences and Ocean Policy Symposium, 1980. p.235-242.

Environmental effects, Crude oil, Oil industry, Fisheries, Fish, Marine organisms, Socio-economic effects, Cost analysis

This paper reviews the nature of oil damage to marine organisms, ranging from direct kill to low-level chronic effects. Environmental variations differences in petroleum types, length and severity of exposure, are some of the factors which can vary so greatly that few generalizations or conclusions can be drawn. Problems of attempting to translate biological damage from oil pollution into economic and social losses are discussed and some policy conclusions are presented.

80A-0636

PROCESSING USE, AND CHARACTERIZATION OF SHALE OIL PRODUCTS

Decora, A.W. and R.D. Kerr. 1979.

Environmental Health Perspectives 30(June):217-223.

Oil shale, Environmental effects, Water quality, Wildlife, Habitats, Socio-economic effects

This article presents an overview of oil shale processing technologies and environmental considerations. The present technologies would adversely impact some or all of the following: Land surfaces, water resources and quality, air quality, wildlife habitats, and social and economic patterns.

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
5. General Aspects

80A-0637

THE ENVIRONMENTAL ASPECTS OF ENHANCED OIL RECOVERY

Donaldson, E.C. 1979.

Energy Sources 4(3):213-229.

Environmental effects, Contamination, *Enhanced oil recovery

Oil displacement by brine injection entails the surface processing of large quantities of saline waters creating the potential for pollution of surface waters and groundwater. Waterflooding techniques also involve the introduction of surfactants and other substances which create potentially polluting oil-water mixtures. This paper outlines the potential pollution hazards of the enhanced oil-recovery processes and the environmental surveillance program being instituted by the Department of Energy.

80A-0638

THE OFFSHORE SEARCH FOR OIL AND GAS

Exxon Corporation. 1978.

New York, NY, Exxon Corporation Public Affairs Department, 1978. 20p. Exxon Background Series.

Offshore, Oil industry, Development, Production, Platforms, Blowouts, Spill response, Spill cleanup, Safety

This publication outlines the search for offshore oil and gas, the difficulties encountered, current offshore drilling technology and new technology and research. Safer offshore operations are stressed, the current accident, blowout, and oil spill record is examined, and available spill cleanup and containment methods are briefly examined.

80A-0639

ELEVENTH OIL SHALE SYMPOSIUM PROCEEDINGS

Gary, J.H. (ed.). 1978.

Golden, Colorado, Colorado School of Mines, 1978. 389p.

Environmental effects, Oil shale, Development, Production, Monitoring, Baseline studies, *Proceedings

Thirty four papers on all aspects of the development, processing and extraction of oil shale are presented. Included are several reports which are directly or possibly relevant to environmental and pollution aspects of oil shale development. Papers by T.L. Thoem et al., R.K. Skogerboe et al., and A.M. Ruskin are abstracted separately in this issue of OPA. [see author index]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
5. General Aspects

80A-0640

IMCO/FAO/UNESCO/WMO/WHO/IAEA/UN JOINT GROUP OF EXPERTS ON THE SCIENTIFIC ASPECTS OF MARINE POLLUTION (GESAMP). REPORT OF THE NINTH SESSION: NEW YORK, 7-11 MARCH 1977.

GESAMP. 1977

IMCO/FAO/UNESCO/WMO/IAEA/UN Joint Group of Experts on the Scientific Aspects of Marine Pollution, Reports and Studies, No. 8. 33p.

Environmental effects, UN, Marine environment, Ships, Offshore, Coastal waters, Development, *Proceedings

This session includes reports and studies on the evaluation of the hazards of harmful substances carried by ships, review of harmful substances in the marine environment, and marine pollution implications of seabed exploration and coastal area development. The agenda, list of documents, list of participants, and an update of the review of harmful substances is included in the annex. [possibly oil pollution related]

[from Oceanic Abstracts 15(4): #78-05902. 1978]

80A-0641

EFFECTS ON NORWEGIAN FISHERIES OF SEA FLOOR LITTERING AND THE PHYSICAL PRESENCE OF THE PETROLEUM INDUSTRY

Heyerdahl, T., Jr. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap. Report No. CM 1977/E59. 7p.

Fisheries, Oil industry, Platforms, Offshore, Drilling, Exploration, Norway, North Sea

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979. Supplement 3:59, #4014. 1979]

80A-0642

ENVIRONMENTAL ASPECTS OF ENHANCED OIL RECOVERY

Konaldson, E.C. 1979.

Energy Sources 4(3):213-229.

Environmental effects, Surveillance, Drilling, Oil wells, *Enhanced oil recovery

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
5. General Aspects

This work presents the potential pollution hazards of enhanced oil-recovery processes and the environmental surveillance program being instituted by the U.S. Department of Energy. The problems discussed are waterflooding techniques involving surface active agents, caustics, and organic polymer compounds which increase the potential for pollution. Other problems discussed are the environmental hazards present with thermal methods of the title subject and field operations such as drilling and renovation of wells.

[from Petroleum Abstracts 20(4): #272,265. 1980]

80A-0643

EVALUATION OF ENVIRONMENTAL IMPACTS OF OUTER CONTINENTAL SHELF
PETROLEUM DEVELOPMENT IN THE PACIFIC NORTHWEST AND ALASKA

Mellinger, P.J., J.W. Anderson and J.R. Vanderhorst. 1979.

Battelle Pacific Northwest Laboratory, Report PNL-RAP-35. 1979. 134p.

OCS, Development, Oil discharges, Estuaries, Coasts, Offshore, Oregon, Washington, Pacific coast, Alaska

"The scope of this report is to: 1) describe the development of petroleum reserves on the Oregon, Washington and Alaskan outer continental shelves (OCS); 2) characterize the technology applicable to OCS development; 3) identify the routine discharges to the marine and estuarine environment resulting from the petroleum resource development of the OCS; and 4) discuss any possible ecological impact from these routine discharges." The report concludes in part that, where effluent data is sufficient, long-term ecological effect from routine discharges have not detected and appear not to occur, and that short-term effects are localized, short-lived, and ecologically insignificant.

80A-0644

OFFSHORE DRILLING IN LANCASTER SOUND: POSSIBLE ENVIRONMENTAL HAZARDS
Milne, A.R. and B.D. Smiley. 1978.

Patricia Bay, Sidney, B.C., Institute of Ocean Sciences, 1978. 95p.

Offshore, Drilling, Safety, Environmental effects, Predictions, Canada,
*Lancaster Sound

Summary not available.

[from Underwater Information Bulletin 10(6): #7812/1334. 1978]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
5. General Aspects

80A-0645

OFFSHORE OIL PRODUCTION AND UNITED STATES FISHERIES

Reid, R.N. and F.W. Steimle. 1978.

International Committee for Exploration of the Sea, ICES C.M. Pap. Rep.,
No. C.M.1978/E:46. 11p.

Fisheries, US, Offshore, Production, Economics, Environmental effects
Summary not available.

[from Marine Pollution Research Titles 6(7): #1256. 1979]

80A-0646

ENVIRONMENTAL IMPACTS OF CONTEMPORARY FOSSIL ENERGY SYSTEMS

Roffman, H.K. 1979.

IES Annual Technical Meeting, 25th, Seattle, 30 April-2 May 1979.
p.521-531.

Environmental effects, Fossil fuels, Drilling, Pipelines, Storage
Potential impacts on water, land, and air quality result from oil
drilling and pipeline malfunctions, storage discharges, and other
oil-related sources. Also reviewed are oil-related socioeconomic
impacts.

[from Environment Abstracts 9(9): #79-05132. 1979]

80A-0647

ESTUARINE INTERACTIONS (CUMULATIVE EFFECTS OF OIL DRILLING AND PRODUCTION ON ESTUARINE AND NEAR-SHORE ECOSYSTEMS)

Sharp, J.M. and S.G. Appan. 1978.

Estuarine Interactions. M.L. Wiley (ed.). New York, Academic Press,
1978. p.57-74. Proceedings of the Fourth International Estuarine
Research Conference, Mt. Pocono, Pennsylvania, 2-5 October 1977.

Offshore, Drilling, Production, Environmental effects, Estuaries,
Ecosystems, Louisiana

The effects of 25 years of oil drilling and production at Timbalier Bay, Louisiana were studied. Using the criteria of habitat variabilities and inhabitant responses, it was concluded that Timbalier Bay has not undergone any significant ecological change as a result of petroleum operations. Natural occurrences such as floods and turbid layers were found to have more impact on the bay's ecosystem than petroleum activities.

[from Environment Abstracts 9(7): #79-03848. 1979]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
5. General Aspects

80A-0648

MARINE SCIENCES AND OCEAN POLICY SYMPOSIUM - A DEFINITION OF THE ISSUES AND A SEARCH FOR A CONSENSUS ON MULTIPLE USES

Simonett, D. (ed.). 1980.

University of California, Santa Barbara, Committee for the Marine Sciences and Ocean Policy Symposium, 1980. xviii + 318p.

Oil-gas leasing, Offshore, OCS, Development, Production, Environmental effects, Fisheries, Resource management, Santa Barbara Channel

The title symposium, held in June 1979, included a session entitled Multiple Uses in the Santa Barbara Channel: A Case Study on the Interactions with Oil and Gas Production. Papers by R. Stegemeier, J.A. Crutchfield, H. Hirose and H.W. Parker are cited separately in this issue of OPA. [see author index]

80A-0649

THE IMPACT OF OIL AND GAS PRODUCTION FROM THE MARINE ENVIRONMENT: AN ANALYSIS OF THE RECORD

Stegemeier, R. 1980.

Marine Sciences and Ocean Policy Symposium - A Definition of the Issues and a Search for a Consensus on Multiple Uses, University of California, Santa Barbara, June 1979. Santa Barbara, California, Committee for the Marine Sciences and Ocean Policy Symposium, 1980. p.221-234.

Environmental effects, OCS, Offshore, Oil industry, Fisheries, Socio-economic effects, Louisiana, Gulf of Mexico

This paper presents a brief review of hydrocarbon inputs into the marine environment, the recent evolution and developments in drilling technology, the ecological impacts of oil-gas activities on living resources (including the shrimp, oyster, menhaden fisheries, sport fishing, and fur industry), and the socio-economic impacts of offshore oil activities. Much of this review uses examples from Louisiana.

80A-0650

COMING SOON: THE BIGGEST OIL SPILL EVER

Stevens, W.K. 1979.

New York Times, July 29 1979:E-20.

Ixtoc 1 blowout, Contingency planning, Mexico

The implications of an oil well blowout off Mexico's Yucatan coast for the Gulf Coast environment are considered. Statistics concerning the blown well are listed. The Mexican government has not adopted a contingency plan to meet an emergency of this type, and this is having an adverse effect on efforts to cap the well.

[from Environment Abstracts 9(10): #79-05959. 1979]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
5. General Aspects

80A-0651

DEVELOPING MANAGEMENT GUIDELINES FOR OIL AND GAS ACTIVITIES: THE LOUISIANA EXPERIENCE

Stone, J.H., et al. 1979.

Coastal Zone Management Journal 6(1):9-35.

Offshore exploration, Development, Coastal waters, Ecosystems, Resource management, Economics, Louisiana

Preliminary management guidelines for oil and gas exploration and development activities in coastal Louisiana have been developed. The guidelines, ranging from strict performance standards to general admonitions, are designed to allow economic activities to complement natural functions of the coastal ecosystem, where possible.

[from Environment Abstracts 10(1): #80-00382. 1980]

80A-0652

ENVIRONMENTAL ASSESSMENT OF THE TERRESTRIAL DISPOSAL OF WASTE DRILLING MUDS IN ALBERTA: PHASE I - CHEMISTRY OF SUMP FLUIDS AND EFFECTS ON VEGETATION AND SOILS

Stroscher, M.T., W.E. Younkin, D.L. Johnson and W.J. Hastie. 1978.

Report to the Canadian Petroleum Association, February 1978. 181p.

Wastewaters, Disposal, Environmental effects, Canada, Onshore impacts, *Drilling muds, *Alberta

Summary not available.

[from Kananaskis Centre for Environmental Research, University of Calgary, Alberta, Canada. Reports and Publications List. #231. p.11. September 1979.]

80A-0653

CAMPECHE BAY OIL CONTINUES TO SPILL FROM WELL, BUT EFFECTS STILL UNKNOWN

Sullivan, T. 1980.

National Fisherman 60(10):24.

Ixtoc I well blowout, Gulf of Mexico, Environmental effects

The intensity of the Campeche Bay Ixtoc I oil spill may have been grossly underestimated, and the spill may not be under control, as official reports claim it is.

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
5. General Aspects

80A-0654

FIGHT OVER GEORGES BANK OIL DRILLING CONTINUES AS NEW LEASE SALE IS SET
Sullivan, T. 1979.
National Fisherman 60(8):3,49.

Offshore, Drilling, Georges Bank, Oil-gas leasing, Fisheries, US Government

Controversy over whether oil drilling should be allowed at Georges Bank is discussed. New England fisheries groups and conservationists are fighting the lease sale of drilling acreage, authorized by Secretary of the Interior Cecil Andrus. The authorization includes establishment of a biological task force to monitor drilling operations and other safeguards. However, "these [safeguards] were considered almost totally unacceptable to fisheries groups fighting the lease sale."

80A-0655

OIL DRILLING LEASES AND STRIP MINING ENDANGER YET UNTAINTED NW FISHERIES
Sullivan, C.T. 1980.
National Fisherman 60(10):42.

US Government, Alaska, Oil-gas leasing, Cold climates, Environmental effects, Spill response

The Department of Interior and the State of Alaska plan to lease oil-gas drilling rights to more than 500,000 acres of the Arctic Beaufort Sea in December, 1980. Eskimos fear that oil drilling will cause serious harm to their environment. "Hoping to diminish some of the criticism, the drillers have agreed to confine their operations to the winter months when the sea is frozen and a spill could be easily contained and cleaned up."

80A-0656

REFINERY PROMPTS CLASSIC BATTLE OF ENERGY VS. ECOLOGY
Sulzberger, A.O., Jr. 1979.
New York Times Aug. 6, 1979:1.

Refineries, Bays, DOE, USCG, Spill response, Virginia

A plan to build a refinery near Portsmouth, Va. may be affected by President Jimmy Carter's recent proposal of an Energy Mobilization Board designed to cut through red tape which delays construction of new energy projects. While DOE supports construction of new refinery capacity on the East Coast, USDI has called the aforementioned refinery one of the most undesirable, due to the lack of USCG resources to cope with oil spills in the bay.

[from Environment Abstracts 9(10): #79-05847. 1979]

E. POLLUTION ASPECTS OF OIL EXPLORATION, DEVELOPMENT & PRODUCTION
5. General Aspects

80A-0657

EPA OIL SHALE RESEARCH/REGULATORY PROGRAM

Thoen, T.L. and E.F. Harris. 1978.

Eleventh Oil Shale Symposium Proceedings. J.H. Gary (ed.). Golden, Colorado, Colorado School of Mines, 1978. p.1-9.

EPA, Environmental effects, Oil shale, Development, Pollution prevention, Pollution control, Regulations, *Enforcement

EPA's program goals include environmental protection during all phases of oil shale development and processing, development of cost effective pollution control technologies, and the promulgation and enforcement of regulations that protect the environment while allowing the development and growth of the oil shale industry.

80A-0658

POLLUTED PLAYAS DESTROY WILDLIFE

Vogler, M. 1979.

Defenders 54(2):42-46.

Wastewaters, Disposal, Oil fields, Oil wells, Onshore, Oil industry, Environmental effects, Groundwater, Wildlife, Lakes, *Playas

Disposal of oilfield wastes is destroying ground water sources and wildlife in the Southwest. Whalen Lake in Texas is being polluted with brine and other oil-field wastes dumped by the Whalen Corp., Phillips Petroleum, and Petroleum Corp. of Texas, with no regard for the adverse effects on wildlife. The involvement of the USDI, the Railroad Commission, and the EPA is described. Regulations of the California Solid Waste Management Board which deal with oil-field wastes are discussed.

[from Environment Abstracts 9(7): #79-04087. 1979]

80A-0659

OCS DEVELOPMENT AND COMMERCIAL AND RECREATIONAL FISHING

Wilman, E.A. 1979.

Coastal Zone Management Journal 5(3):211-231.

OCS, Development, Fisheries, Risk analysis, Atlantic Coast

Better estimates of environmental risks have been necessitated, as can be seen through the controversies which have developed over Outer Continental Shelf leasing in the Baltimore Canyon off New Jersey and Georges Bank, off New England. Progress in reducing uncertainty about the magnitude of impacts on fishing industries is possible. Costs vs. benefits of OCS development as it relates to commercial and recreational fishing are discussed.

[from Environment Abstracts 9(8): #79-04549. 1979]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE

1. Tankers and Ships

80A-0660

LIBERIAN TANKER REMAINS AFIRE AND LEAKING OIL OFF TEXAS COAST

Anon. 1979.

Ocean Industry 14(12):109-110.

Burning, Oil spills, Beaches, Texas, Coastal waters, *Burmah Agate spill

An early morning collision between 2 Liberian owned vessels off the Texas coast put the U.S. Coast Guard and the U.S. Navy at work in a major cleanup effort at sea and on shore. The tanker Burmah Agate burned and leaked oil on Texas beaches. Officials estimated that about 120,000 bbl of oil burned, 30,950 bbl polluted the water and shore, and about 238,000 bbl remained on the stricken vessel. No active efforts were made to extinguish the fire due to the danger of reflash and because the fire was burning up oil which would otherwise have polluted nearby beaches.

[from Petroleum Abstracts 20(19): #275,769. 1980]

80A-0661

TRINIDAD-TOBAGO HAS WORST TANKER ACCIDENT IN HISTORY

Anon. 1979.

Carib-Latin Energy Consultants Ltd. 3(7):7-9.

Tankers, Oil slicks, Pollution control, Spill response, Caribbean Sea

An oil slick of 50 square miles occurred following the collision of 2 large crude-oil carriers in the title area. A high fatality rate for ship personnel was noted and fire aboard both ships broke out. Ship firefighting and pollution control measures are described.

[from Petroleum Abstracts 20(15): #274,603. 1980]

80A-0662

THE CHRISTOS BITAS INCIDENT

British Petroleum Company. 1979.

London, British Petroleum Company. Environmental Control Centre, 1979. 23p.

Tankers, Spill cleanup, *Christos Bitas spill

Summary not available.

[from Marine Pollution Research Titles 7(2): #284. 1980]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE
1. Tankers and Ships

80A-0663

ELENI V. THE GOVERNMENT'S REPLY TO THE FOURTH REPORT FROM THE SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY

Department of Trade, Great Britain. 1978.
London, HMSO, 1978. 37p.

Tankers, Oil spills, Spill response, Government agencies, UK, Eleni V spill

Summary not available.

[from Marine Pollution Research Titles 6(7): #1218. 1979]

80A-0664

TANKER SPILLS, COLLISIONS AND GROUNDINGS

Devaney, J.W., S. Protopapa and R. Klock. 1979.
Massachusetts Institute of Technology, Report MITSG-79-14, NOAA-79072303, NTIS Report PB-299 204/8SL. 110p.

Tankers, Statistical analysis, Oil transport, *Collisions, *Groundings

"The basic finding is that collisions are a communication and coordination problem rather than a detection problem...that conning or guidance errors are as important as navigational errors in causing groundings and many of the conning-related groundings are connected with pilot transfers...[and that] simplistic arguments relating tanker traffic and tanker casualties are not supported by the casualty data which indicate that local factors appear to dominate."

80A-0665

TANKERS AND THE FLAGS THEY FLY

Exxon Corporation. 1979.
New York, NY, Exxon Corporation Public Affairs Department, 1979. 43p.
Exxon Background Series.

Oil transport, Tankers, Oil discharges, Pollution control, Personnel training, Equipment, International agreements, *Substandard ships

This background paper on the transport of oil by tankers addresses in part the safety and environmental problems associated with tankers. "Substandard ships are the real problem" - ships which fail to meet basic requirements of construction, equipment and machinery, and which are inadequately manned by poorly trained crews or which are poorly maintained or obsolescent. Comprehensive international pollution prevention agreements, new antipollution equipment and procedures, and port state legal action against substandard tankers are among solutions offered.

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE

1. Tankers and Ships

80A-0666

THE LOSS OF THE OLYMPIC BRAVERY [IN FRENCH]

Lauziere, G. de la. 1978.

Revue Maritime (Nouv. Ser.), No. 338:2087-2097.

Tankers, Marine environment, *Olympic Bravery spill

Summary not available.

[from Marine Pollution Research Titles 6(7): #1234. 1979]

80A-0667

OCEAN TRAGEDY [NEWS BRIEF]

McCaul, J. 1977.

Environment 19(1):26.

Tankers, Oil spills, *Accidents

Chronologically listed and briefly described are eleven serious tanker accidents which occurred between December 15, 1976 and January 10, 1977, beginning with the Argo Merchant grounding, and ending with the sinking of the Chester A. Poling. Eight of these incidents involved ships of Liberian registry.

80A-0668

OIL POLLUTION OF THE OCEANS: A TANKER OWNER'S PERSPECTIVE

Massachusetts Institute of Technology. 1979.

Cambridge, Massachusetts Institute of Technology, Report MITSG-79-1, NTIS Report PB-297 771/8SL. 34p. Proceedings of the 7th Annual Sea Grant Lecture and Symposium held at MIT, 24 October 1978.

Tankers, Oil spills, Oil discharges, IMCO, International agreements, *Proceedings

Oil pollution by tankers is less than 1/3 of the total oil pollution, and "only a tiny fraction is the result of the much dramatized accidents. The rest... is of the operational kind." Stressed is the need to resolve the differences in working out and agreeing upon the Protocols of 1978 arrived at by the IMCO Conference of February 1978.

80A-0669

MARINE ACCIDENT REPORT. MV ANCO SCEPTRE COLLISION WITH THE CROWN CENTRAL PETROLEUM CORPORATION PIER, HOUSTON SHIP CHANNEL

National Transportation Safety Board. 1979.

NTIS Report PB-297 456/6SL. 19p.

Tankers, Ships, Harbors, Texas, *M/V Anco Sceptre collision

Summary not available.

[from Spill Technology Newsletter 4(5):273. 1979]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE

1. Tankers and Ships

80A-0670

ARRANGEMENT AND STRUCTURAL STUDY FOR VERY LARGE CRUDE CARRIERS (VLCC) SEGREGATED BALLAST TANKERS. EXECUTIVE SUMMARY.

Newport News Shipbuilding. 1978.

Final Report MA-RD-900-79025. _p.

Tankers, Segregated ballast, Pollution prevention, Oil discharges, Design-engineering, Safety

This report summarizes the results of a program to evaluate the economic impact of the 1973 Marine Pollution Conference segregated ballast requirements. A 265,000 DWT tanker was redesigned for segregated ballast using single bottom, double bottom, and double hull concepts to meet the 1973 requirements. Since the work was substantially complete before the Tanker Safety and Pollution Prevention Conference of 1978 (TSPP), these designs do not meet these 1978 requirements. In addition to new construction, retrofitting segregated ballast capability using liquid or solid ballast in two sizes of tankers was investigated.

[from Government Reports Announcements 79(24): #PB-298 825 1979]

80A-0671

DUCKING LIABILITY AT SEA

Novick, S. 1977.

Environment 19(1):25-27,44.

Oil spills, Tankers, Argo Merchant spill

This article recounts the series of five serious oil tanker accidents in US waters which occurred in the last two weeks of 1976. Involved in separate incidents were the Argo Merchant, the Sansinena, the Oswego Peace, the Olympic Games, and the Daphne. "All five tankers were chartered in Liberia, and even nominal owners were difficult to identify."

80A-0672

[AMOCO CADIZ OIL SPILL] EDITORIAL INTRODUCTION

Spooner, M.F. 1978.

Marine Pollution Bulletin 9(11):281-284.

Environmental effects, Toxicity, Marine organisms, Coasts, Amoco Cadiz spill, Spill cleanup, France

An overview of the Amoco Cadiz tanker disaster of March 1978, off the coast of Brittany is presented. The entire cargo of 223,000 tons of light crude oil, as well as the ship's own fuel was lost over a two week period. This editorial reviews toxicity and acute effects on the plankton, algae, and the nearshore and intertidal fauna. Also reviewed are cleanup measures and costs, and lessons learned from the "accident that could never happen".

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE

1. Tankers and Ships

80A-0673

WHEN TWO GIANTS COLLIDE

Steen, G.L. 1979.

Mobil World 45(8):6-8.

Spill response, Dispersants, Oil industry, Tankers, Caribbean Sea,
*Aegean Captain spill, *Atlantic Empress spill

Fire and explosions occurred when the Liberian Aegean Captain and the Greek Atlantic Empress collided in July 20 miles off the shore of Trinidad and Tobago. Antipollution measures by Mobil's Pollution Response Team included firefighting for the 2 vessels, towing them away from land in different directions and preparing to spray the developing oil slick with dispersants.

[from Petroleum Abstracts 20(7): #273,020. 1980]

2. Pipelines

80A-0674

ALASKA PIPELINES FIRST OIL SPILLS [NEWS BRIEF]

Anon. 1979.

New Scientist 84(1176):96.

Pipelines, Oil spills, Leakage, Trans-Alaska Pipeline, Rivers

In June 1979 about 2000 bbl of crude oil were spilled from the Trans-Alaska Pipeline into the Atigun River. Five days after this incident, another stretch of buried pipeline ruptured but the leakage was contained. The first spill contaminated about 43 km of riverbank and the adverse impact on fish and other aquatic life may be considerable.

80A-0675

CANADA AND U.S. SQUARE OFF OVER PUGET PIPELINE [NEWS BRIEF]

Anon. 1980.

National Fisherman 60(10):42.

Pipelines, Puget Sound, Fisheries, Fish, Environmental effects,
*Salmon

Residents of Puget Sound are concerned over the proposed Northern Tier pipeline. This pipeline would cut across Puget Sound, possibly endangering the salmon fisheries, through the threat of oil pollution. Biologists claim that only 7 ppm of oil can severely impair the salmon's ability to return to their spawning grounds.

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE
2. Pipelines

80A-0676

PIPELINE SPILLAGES [NEWS BRIEF]

Anon. 1979.

Marine Pollution Bulletin 10(11):316-17.

Pipelines, Oil spills, Europe, Recovery, Contamination

CONCAWE compiled a statistical summary of spillages from cross-country oil pipelines in Western Europe, reporting 15 incidents involving 3639 m³ of spilled oil. Two-thirds of the oil spilled was recovered in the immediate area, cause of one-half of the spillage was corrosion.

80A-0677

SPILLAGES FROM OIL INDUSTRY CROSS-COUNTRY PIPELINES IN WESTERN EUROPE. STATISTICAL SUMMARY OF REPORTED INCIDENTS 1976.

CONCAWE. 1977.

The Hague, CONCAWE Report No. 9/77, 13p.

Pipelines, Statistics, Oil spills, Spill removal, Oil industry, Europe

With the data provided by the oil industry pipeline systems in Western Europe, this report was prepared by The Oil Pipelines Special Task Force No. 1, and tabulates the total amount of title spills.

[from Fuel and Energy Abstracts 19(2):167,#23-0176. 1978]

80A-0678

PIPELINE FAILURE: A NEED FOR IMPROVED ANALYSES AND SITE SURVEYS

Demars, K.R., V.A. Nacci and W.D. Wang. 1977.

Ninth Annual Offshore Technology Conference, OTC 2966, Houston, 2-5 May 1977. Dallas, Texas, Offshore Technology Conference, 1977. Vol. III:63-70. Proceedings.

Pipelines, Oil transport, Leakage, *Pipeline failure

Summary not available. [possibly oil pollution related]

[from Marine Pollution Research Titles 6(7): #1208. 1979]

80A-0679

FISH AND WILDLIFE PROTECTION IN THE PLANNING AND CONSTRUCTION OF THE TRANS-ALASKA OIL PIPELINE

Morehouse, T.A., R.A. Childers and L.E. Leask. 1978.

Pipelines, Trans-Alaska Pipeline, Fish, Wildlife, Government agencies, Regulations

This report examines and assesses government surveillance policy towards fish and wildlife protection before, during, and since the construction of the Trans-Alaska oil pipeline. Although the report looks primarily

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE

2. Pipelines

at the involvement of federal agencies in the pipeline planning and construction process, it also includes some discussion of state planning and surveillance activities.

3. Loading and Offloading Facilities

80A-0680

HOSEPIPE LEAK CAUSES SPILL [NEWS BRIEF]

Anon. 1978.

Marine Pollution Bulletin 9(12):316.

Oil transfer, Leakage, Oil slicks, Dispersants, Birds, Mortality

Two hundred tons of crude oil were lost when a hosepipe being used to unload a tanker at Amlwch, North Wales, began to leak. The resulting oil slick was said to be effectively dispersed with chemicals but "more than a week later the oil came ashore together with dead seabirds."

80A-0681

AFTERMATH OF THE SULLOM VOE OILSPILL [NEWS BRIEF]

Bourne, W.R.P. 1979.

Marine Pollution Bulletin 10(8):216-17.

Oil terminals, Ballast, Pollution prevention, Regulations, Tankers, Oil transfer, UK, *Sullom Voe

A series of conditions have been imposed on tankers in Shetland Island waters in the wake of the title spill. Tankers must not release ballast at sea until they are 300 miles outward bound from European waters and they will not be loaded if they arrive with less than 35% ballast. A ballast processing plant is scheduled for opening in August 1979.

80A-0682

ECOLOGICAL EFFECTS OF MARITIME HARBOURS: WITH SPECIAL REFERENCE TO OIL POLLUTION

Branco, S.M. 1979.

Revista DAE 39(120):64-70.

Oil transfer, Oil transport, Harbors, Environmental effects

Summary not available.

[from Marine Pollution Research Titles 7(2): #283. 1980]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE
3. Loading and Offloading Facilities

80A-0683

POTENTIAL PACIFIC COAST OIL PORTS: A COMPARATIVE ENVIRONMENTAL RISK ANALYSIS. VOLUME I.

Department of Fisheries and Environment, Canada. 1978
Vancouver, B.C., Fisheries and Environment, Working Group on West Coast Deepwater Oil Ports. 119p.

Ports, Pacific Coast, Environmental effects, Oil transfer, Oil transport, Risk analysis, Canada

Summary not available.

[from Marine Pollution Research Titles 7(2): #286. 1980]

80A-0684

POTENTIAL PACIFIC COAST OIL PORTS: A COMPARATIVE ENVIRONMENTAL RISK ANALYSIS. VOLUME II. SUPPLEMENTARY APPENDICES.

Department of Fisheries and Environment, Canada. 1978.
Vancouver, B.C., Fisheries and Environment, Working Group on West Coast Deepwater Oil Ports. 123p.

Ports, Pacific Coast, Environmental effects, Oil transfer, Oil transport, Risk analysis, Canada

Summary not available.

[from Marine Pollution Research Titles 7(2): #287. 1980]

80A-0685

LOAD ON TOP - FROM THE SUBLIME TO THE ABSURD

Pritchard, S.Z. 1978.

Journal of Maritime Law and Commerce 9(2):185-224.

Oil discharges, Tankers, Pollution control, Segregated ballast, Ballasts, Ports, *Load on top method

This discussion of solutions to tanker operational pollution compares the following methods: total cleaning at port of discharge; retention on board or total cleaning at loading port; segregated ballast combined with other methods; Load on top (LOT) and prohibited discharge zones. Except for discharging beyond prohibited zones, the LOT method raises the greatest amount of pollution and losses.

80A-0686

ENVIRONMENTAL MANAGEMENT OF A SHIP CHANNEL - HARBOR COMPLEX

Reavis, M.W. and R.W. Hann, Jr. 1977.

Texas A & M University, Sea Grant Report TAMU-SG-78-202. 145p.

Harbors, Ports, Ships, Environmental effects, Texas, Gulf of Mexico, *Environmental management

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE
3. Loading and Offloading facilities

This article discusses the environmental management of a typical harbor complex along the Texas Gulf Coast. Oil spills are included among the pollution problems considered. The impact of each problem upon the waterways is discussed, priorities are outlined, a general solution is provided, and a suggested plan of action is presented.

[from Oceanic Abstracts 15(4): #78-05485. 1978]

4. Storage Facilities

80A-0687

ENVIRONMENTAL STUDIES OF PORT VALDEZ, ALASKA

Colonell, J.M. 1977.

4th International Conference on Port and Ocean Engineering under Arctic Conditions, St. John's, Newfoundland, Memorial University of Newfoundland, Ocean Engineering Information Centre, 1977. p.872-884.

Environmental effects, Ports, Alaska, Ballast, Oil tanks, Oil-water separation

Summary not available.

[from Marine Pollution Research Titles 6(7): #1204. 1979]

80A-0688

UNDERGROUND OIL STORAGE IN SWEDEN

Siosteen, B. 1979.

Endeavour 3(4):158-162.

Crude oil, Sweden, Pollution prevention, *Underground caverns

Sweden is storing strategic reserves of oil underground in huge caverns blasted from solid rock in response to economic, social, and political considerations. Among the advantages cited is that, should a mishap occur, there would be no spillage of oil as in the case of aboveground storage facilities.

80A-0689

NOMOGRAPH QUICKLY FINDS TANK'S DIKED-IN AREA

Zanker, A. 1979.

Process Engineering, May:67-69.

Spill containment, Oil tanks, *Nomograph

This work describes and presents a nomograph for the calculation of diked-in areas to contain spills from storage tanks and various other process vessels. The essential data used to construct the nomograph are the retaining wall height and diameter of the dike area.

[from Petroleum Abstracts 20(6): #272,775. 1980]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE
5. Legal and Regulatory Aspects

80A-0690

OIL TANKERS NEED SAFETY STANDARDS

Becker, S.W. 1977.

Environmental Policy and Law 3(2):79.

Tankers, Regulations, Safety, Pollution prevention, Personnel training, Guidelines, USCG, Oil transport

Hearings conducted on January 11-12, 1977 by the US Senate Commerce Committee are reviewed. The hearings assessed current and needed domestic and international controls governing the design, construction, equipment, operation, and personnel of vessels carrying oil in bulk.

6. General Aspects

80A-0691

THE PRINCIPAL OFFSHORE OIL-SPILL ACCIDENTS AND THE TANKER CASUALTIES DATA BANK (1955-1979) COMPILED BY INSTITUT FRANCAIS DU PETROLE [IN FRENCH]

Bertrand, A.R.V. 1979.

Revue de l'Institut Francais du Petrole 34(3):483-526.

Tankers, Ships, Offshore, Drilling, Oil spills, Sources, France, Information systems, *Data bank, *Accidents

This work describes the results of documentary activity by Institut Francais du Petrole regarding oil spills, including 1) list of accidents resulting in a spill of more than 500 tons and coming from various origins, and 2) data bank on ship accidents. The data bank includes more than 400 accidents occurring between 1955 and 1979.

[from Petroleum Abstracts 20(1): #271,668. 1980]

80A-0692

NON-ATTAINMENT PROBLEMS OF TRANSPORTING OIL

Hart, F.C. 1977.

APCA Hydrocarbon Feasibility Conference, New York City. Technical Report April 4-5, 1977:22-35.

Hydrocarbons, Oil transport, Ports, Harbors, Oil transfer, California

The problem of hydrocarbons generated by transporting crude oil and petroleum products is analyzed. "An assessment of a proposed crude oil handling project at the Port of Long Beach, California - an area with the worst hydrocarbon/oxidant problem in the U.S. - reveals mitigating factors and possible trade-offs in a non-attainment area." [possibly oil pollution related]

[from Environment Abstracts 9(7): #79-03564. 1979]

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE
6. General Aspects

80A-0693

PHOTOGRAPHIC PRESENTATION OF SOME ASPECTS OF THE GROUNDING OF
AMOCO CADIZ [IN FRENCH]

Le Fevre, J. 1978.

Actes des Colloques du Centre National pour l'Exploitation des
Oceans, No.6:227-240.

Tankers, Amoco Cadiz spill, France, *Groundings, *Photography

Summary not available.

[from A Bibliography on Marine and Estuarine Oil Pollution. D.S. Moulder
and A. Varley. Plymouth, UK, Marine Pollution Information Centre, 1979.
Supplement 3:30, #3740. 1979]

80A-0694

WINTER BARGE GROUNDINGS SPARK COASTAL N.J. OIL SPILL JITTERS

Muldoon, A. 1980.

National Fisherman 60(12):56,57.

Ships, Oil spills, New Jersey, Fisheries, *Tourism

Two barges tore loose from their tugboats and went aground twice
within a month in New Jersey. One of the barges, the Michelle F.,
had a 2.94 million-gal. cargo of oil, but spilled very little.
The incidents have aroused anxiety over the possibility of more
oil spills, endangering the tourism and fishing industries on which
the area is heavily reliant.

80A-0695

SHIPPING: CONFLICT WITH OTHER USERS OF THE SANTA BARBARA CHANNEL
Parker, H.W. 1980.

Marine Sciences and Ocean Policy Symposium - A Definition of the
Issues and a Search for a Consensus on Multiple Uses, University of
California, Santa Barbara, June 1979. Santa Barbara, California,
Committee for the Marine Sciences and Ocean Policy Symposium, 1980.
p.261-266.

Ships, Tankers, OCS, Development, Production, Oil transport, Ports,
Santa Barbara Channel, Pacific Coast

Shipping and other uses of the Santa Barbara Channel have long
coexisted and their interactions will increase in the future. Among
the coexistent uses reviewed and discussed in this paper are OCS oil-
gas leasing and development, oil production, tanker transport of oil
from the Trans-Alaskan Pipeline, and oil loading and offloading
facilities.

F. POLLUTION ASPECTS OF OIL TRANSPORT, TRANSFER AND STORAGE
6. General Aspects

80A-0696

POLLUTING INCIDENTS IN AND AROUND U.S. WATERS. CALENDAR YEAR 1977 AND 1978.

US Coast Guard. 1980.

Report COMDTINST MI6450.2. (Old CG-487). 44p.

Oil spills, Statistics, USCG, Information systems, Coastal waters, US, *1977-1978 data

Statistics for 1977-1978 on oil and hazardous materials spills gathered through the USCG Pollution Incident Reporting System are tabulated. Spill statistics are categorized by area, type of location, type of material discharged, source, cause, discharge versus size, and by month.

80A-0697

CTS AT PALAU - EXPORTING POLLUTION?

Yuzuru, H. 1978.

Japan Quarterly 25(1):51-62.

Oil transport, Oil transfer, Tankers, Pacific Ocean, Ports, Economics, Environmental effects, *Malacca Straits, *Palau

Crude oil transshipment stations have been proposed throughout the South Pacific; the most eagerly promoted is a superport in Palau. This paper examines the economic background and environmental dangers facing Palau and the Straits of Malacca as oil is shipped from the Middle East to Japan.

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
1. Waste Treatment and Disposal Methods

80A-0698

OIL REFINERY DISCHARGES [NEWS BRIEF]

Anon. 1979.

Marine Pollution Bulletin 10(12):344-5.

Refineries, Disposal, Europe, Marine environment, Toxicity, Wastewater treatment

A major study sponsored by CONCAWE concludes, "the three 'danger' criteria of toxicity, persistence, and bioaccumulation are very difficult to apply to refinery effluents, since their complexity and the variability of receiving waters makes measurement impractical. The report calls for further study of the relationship between composition of refinery effluent and toxicity."

80A-0699

DISPOSAL OF AN INDUSTRIAL WASTE WATER BY LAND DISPOSAL

Baker, G.G. and P.G. Moe. 1978.

American Society for Microbiology, 78th Annual Meeting, Las Vegas, Nevada, 1978. R. Slepecky (ed.). Washington, DC, American Society for Microbiology, 1978. p.208. Abstract No.Q81.

Waste oil, Disposal, Land farming, Emulsions, Soil, Toxicity, Plants

The use of soil as a disposal medium for industrial waste oil emulsions was investigated. Although no obvious deterioration of chemical, physical and biological conditions of the soil was revealed, a significant buildup of hexane extractable residues in upper soil horizons was observed, and phytotoxicity of treated soils to selected crop types was noted.

80A-0700

POLLUTION CONTROL SYSTEM

Bertelson, A.B. 1978.

US Patent 4,116,835.

Contamination, Wastewater treatment, Oil-water separation, Oil removal, Coalescence, Patent

A system is described by which oil and other contaminants are separated from aqueous effluents. The device includes means for introducing the contaminated effluents into a separation zone and passed through the labyrinth course of a coalescing chamber to separate oil particles. Removal of the oil and the effluents is also described.

[from Petroleum Abstracts 19(36): #267,366. 1979]

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
1. Waste Treatment and Disposal Methods

80A-0701

FEASIBILITY OF ZERO AROMATIC HYDROCARBON DISCHARGE FROM A STYRENE MONOMER FACILITY

Bruderly, D.E., J.D. Crane and J.D. Riggenbach. 1978.
Industrial Waste Conference, 32nd, Purdue University, Lafayette,
Indiana, 10-12 May 1977. Ann Arbor, Michigan, Ann Arbor Science
Publishers Inc., 1978. p.726-732.

Wastewater treatment, Petrochemicals, Aromatic hydrocarbons,
Contamination, *Styrene monomer facility

Wastewaters from the title facility were contaminated with benzene,
ethylbenzene, diethylbenzene, styrene, and toluene, and processes
were developed to eliminate aromatic hydrocarbon discharges. This
study resulted in a recommendation of a system which optimizes water
reuse, minimizes system upsets, segregates clean storm water, and
results in a final discharge with aromatic hydrocarbon concentrations
of under 1 mg/L.

80A-0702

WASTE WATER OF REFINERY CRUDE OIL [IN FRENCH]

Chevallier, R. 1979.
Techniques Eau Assainissement, Vol 386:33-42.

Wastewater treatment, Refineries, Oil-water separation, Biodegradation,
Sludge, Flocculation, Contamination

"The review, with 4 references, covers types of contaminated waters,
gravity separation, flocculation, biooxidation, the removal of H_2S
and NH_3 , sludge treatment, treatment of waste caustic, and water
recycling."

[from Chemical Abstracts 91(8):62000n. 1979]

80A-0703

SURVEY ON QUALITY OF REFINERY EFFLUENTS IN EUROPE. A COMPARISON
BETWEEN 1969 AND 1974 PERFORMANCES.

CONCAWE. 1977.
Den Haag, Holland, CONCAWE Report No.4/77. 13p.

Refineries, Wastewaters, Pollution control, *Effluent comparisons
Summary not available.

[from Marine Pollution Research Titles 4(6): #1045. 1977]

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
1. Waste Treatment and Disposal Methods

80A-0704

CUSTOM DESIGNS CUT EFFLUENT TREATMENT COSTS. CASE HISTORIES AT CHEVRON U.S.A., INC.

Davies, B.T. and R.W. Vose. 1978.

Industrial Waste Conference, 32nd, Purdue University, Lafayette, Indiana, 10-12 May 1977. Ann Arbor, Michigan. Ann Arbor Science Publishers Inc., 1978. p.1035-1060.

Refineries, Wastewater treatment, Oil-water separation, Oil removal

This paper reviews the various processing steps for refinery effluent treatment, with emphasis on Chevron's flexibility in designing custom wastewater treatment systems to meet different needs. Discussed are oil separation, including primary (gravity) deoiling, and secondary deoiling; biological treatment, including equalization and various types of biotreaters; and final suspended solids removed.

80A-0705

ACTIVATED CARBON IMPROVES EFFLUENT QUALITY IN REFINERY SLUDGE PROCESS

Grieves, C.G., et al. 1977.

Industrial Wastes, 1977. 6p.[sic]

Wastewater treatment, Refineries, Activated sludge, Solid wastes,
*Activated carbon

Summary not available. [see related papers below]

[from Waste Materials Biodegradation Research Titles 5(3):64,
#78/3-UU-2377. 1978]

80A-0706

EFFLUENT QUALITY IMPROVEMENT BY POWDERED ACTIVATED CARBON IN REFINERY ACTIVATED SLUDGE PROCESSES

Grieves, C.G., M.K. Stenstrom, J.D. Walk and J.F. Grutsch. 1977.

Proceedings of the American Petroleum Institute Refining Department Midyear Meeting, 42nd, 1977. 25p.

Wastewater treatment, Refineries, Activated sludge, Solid wastes,
*Activated carbon

Summary not available. [see related paper below]

[from Waste Materials Biodegradation Research Titles 6(2):42,
79/2-UU-1616. 1979]

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
1. Waste Treatment and Disposal Methods

80A-0707

POWDERED CARBON IMPROVES ACTIVATED SLUDGE TREATMENT

Grieves, C.G., M.K. Stenstrom, J.D. Walk and J.F. Grutsch. 1977.
Hydrocarbon Processing 56(10):125-130.

Wastewater treatment, Refineries, Activated Sludge, Solid wastes,
*Activated carbon

Pilot plant tests indicate that use of powdered activated carbon is an attractive, cost effective approach for improving refinery activated sludge effluent. Details of the proposed process are presented.

80A-0708

TRACE CONTAMINANTS IN REFINING EFFLUENTS - AN OVERVIEW OF THE SAMPLING AND ANALYSIS PROBLEM AND ITS IMPLICATIONS

Hallett, J.D. n.d.
Water Conservation [no date given]:231-234.

Refining, Wastewaters, Contamination, Sampling, Chemical analysis
Summary not available.

[from Waste Materials Biodegradation Research Titles 6(2):42,
#79/2-UU-1626. 1979]

80A-0709

TRACE CONTAMINANTS IN REFINING EFFLUENTS - RESULTS OF THE EPA PRIORITY SCREENING SURVEY

Hallett, J.D. n.d.
Recent Developments in Environmental Control [no date given]:233-236.

Refining, Wastewaters, Sampling, EPA, *Priority pollutants
Summary not available.

[from Waste Materials Biodegradation Research Titles 6(2):42,
#79/2-UU-1626. 1979]

80A-0710

ASSESSMENT OF ACTIVATED CARBON FOR ENVIRONMENTAL CONTROL OF TRACE ORGANICS IN PETROLEUM REFINERY WASTEWATER

Harrison, W., R.D. Flotard and D.L. Ford. 1979.

Argonne National Laboratories, Report ANL/WR-79-3. 85p.

Wastewater treatment, Refineries, Economics, Cost analysis,
*Activated carbon

Activated carbon technology is found to require less capital, lower operating and energy costs, greater flexibility in dose, and minimized possibility of upset of the activated-sludge process.

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL

1. Waste Treatment and Disposal Methods

80A-0711

OIL SPILL DEBRIS: WHERE TO PUT THE WASTE

King, F. 1978.

Environmental News, April 1978:8.

Spill cleanup, Pollution control, Reclamation, Waste oil treatment, Burning, Land farming

EPA representatives recommend burning oil debris where air pollution standards permit. The oily wastes are difficult to dispose of properly, even if buried in a landfill, because of possible seepage and groundwater contamination. EPA studies suggest that only debris should be reclaimed, burned, land cultivated, and buried.

[from Combustion: An Oil Spill Mitigation Tool, Report DOE/EV-1830-1, p.B-18. 1979]

80A-0712

LAND AS A WASTE MANAGEMENT ALTERNATIVE

Loehr, R.C. (ed.). 1977.

Ann Arbor, Michigan, Ann Arbor Science Publishers, 1977. 811p.

Proceedings of the 1976 Cornell Agricultural Waste Management Conference.

Wastewaters, Disposal, Waste oil, Industries, Land farming

The title book deals with land disposal of industrial, municipal and agricultural wastes, including oily wastes. A paper entitled "Land disposal of oily wastewater by means of spray irrigation" (D.M. Neal, R.L. Glover and P.G. Moe) details the successful disposal of over 136 million L (36 million gal) of oily wastewater with no apparent detrimental effects to the environment.

80A-0713

DIFFERENTIAL TRACING OF OILY WASTE AND THE ASSOCIATED WATER MASS BY TAGGING WITH RARE EARTHS

McCown, D.L. 1979

Water Research 13(11):1065-1076.

Wastewaters, Waste oil, Monitoring, Source identification, *Rare earth tagging

A method developed for tagging oily waste with dysprosium and the associated fresh water with samarium was applied in two field experiments that traced polluted water from the Indiana Harbor Canal into Lake Michigan. The results of a summer, floating-plume experiment showed that tagged oil did not immediately resurface. After artificial mixing there were no distinguishable differences between the movement of the oil and water over a 4 Km distance. A winter experiment showed that Lake Michigan took in oily wastes; thus different transport modes for water at all depths was revealed.

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
1. Waste Treatment and Disposal Methods

80A-0714

TREATMENT OF REFINERY WASTEWATER USING A FILTRATION-ACTIVATED CARBON SYSTEM

McCrodden, B.A. 1979.

Report EPA-600/2-79-066, NTIS Report PB-295 780/1SL. 91p.

Wastewater treatment, Refineries, Filtration, Absorption, *Activated carbon

The objective of this report was to demonstrate the applicability of a dual media filtration-activated carbon adsorption system for the total treatment of petroleum refinery wastewater. The 2.2 million gallon/day wastewater treatment facility has demonstrated average removals by the dual media filters of 58% of the oil, whereas the activated carbon absorbers have removed an average of 70% of the oil.

80A-0715

BIOLOGICAL TREATMENT OF REFINERY WASTES

Mahmud, Z. and N.C. Thanh. 1979.

Industrial Waste Conference, 33rd, Purdue University, Lafayette, Indiana, 9-11 May 1978. Ann Arbor, Michigan, Ann Arbor Science Publishers Inc., 1979. p.515-525.

Biological treatment, Refineries, Petrochemicals, Wastewater treatment

Stabilization of the complex wastes from refineries and petrochemical industries is a major challenge. Biological oxidation is usually the most economical method of reducing the toxicity, organic content and objectionable appearance of effluent waters. This paper presents the experimental development of parameters to stabilize the petroleum refinery wastewaters.

80A-0716

TREATMENT OF OIL CONTAMINATED WASTE WATERS BY FOAM FRACTIONATION

Mathews, A., P.R. Bishoi and W.Y. Svrcek. 1979.

Water Research 13(4):385-390.

Wastewater treatment, Oil removal, Contamination, Emulsions, Absorption

A laboratory investigation was carried out to determine whether a foam separation process could remove organic pollutants from waste water. The effect of variables — airflow rate, surfactant flow rate, pressure, pH and concentration of the solid absorbant were examined for different feed streams. Foam separation achieved 98% removal of oil alone, from a waste stream contaminated with emulsified oil. The three phase fluidized bed absorption process gave 98% reduction of organics in the two industrial waste waters tested.

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
1. Waste Treatment and Disposal Methods

80A-0717

LAND DISPOSAL OF OILY WASTEWATERS BY MEANS OF SPRAY IRRIGATION

Neal, D.M., R.L. Glover and P.G. Moe. 1977.

Land as a Waste Management Alternative. R.C. Loehr (ed.). Ann Arbor, Michigan, Ann Arbor Science Publishers, 1977. p.757-767.

Wastewaters, Disposal, Waste oil, Biodegradation, Land farming, Reclamation, Fuel oil

Since 1972, over 136 million L (36 million gal) of oily wastewaters have been successfully disposed of through a land application system, in which the oil is biodegraded by soil microorganisms. About 2.3 million L (600,00 gal) of oil have also been reclaimed in the process and used successfully as boiler fuel. The value of the salvaged oil has more than paid for the entire costs of the project to date.

80A-0718

PLANT-SOIL ASSIMILATIVE CAPACITY FOR OILS

Overcash, M.A. and D. Pal. 1979.

American Institute of Chemical Engineers, Symposium Series 75(190): 357-365.

Landfarming, Plants, Soil, Waste oil, Disposal

This study describes the elements of the land as an oil-waste receiver, discusses the processes involved in the plant-soil assimilation of petroleum oils and details basic design criteria for land-based oil treatment systems. The conclusion is that assimilation of waste-oil by plant-soil systems represents a viable means of waste management.

[from Petroleum Abstracts 20(8): #273,228. 1980]

80A-0719

WASTEWATER TREATMENT TECHNOLOGY

Patterson, J. 1977.

Ann Arbor, Michigan, Ann Arbor Science Publishers, Inc. 1977. 265p.

Waste oil treatment, Wastewater treatment, Industries, Economics, *Capabilities

For 22 industrial pollutants, including oil wastes, treatment technologies that have been proven in full scale application are discussed. The capabilities and economics of various technologies are compared.

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
1. Waste Treatment and Disposal Methods

80A-0720

LAND APPLICATION OF OIL

Raymond, R.L., J.O. Hudson and V.W. Jamison. 1979.
American Institute of Chemical Engineers, Symposium Series 75(190):
340-356.

Waste oil, Disposal, Land farming, Crude oil, Fuel oil, Crankcase oil,
Monitoring, Biological effects, Plants, Soil

The fate and effects of 6 oils (2 crude oils, a No.2 fuel oil, a residual No.6 oil, and used crankcase oils) were monitored for 3 years after being applied to experimental plots of land at Marcus Hook, Pennsylvania, Corpus Christi, Texas, and Tulsa, Oklahoma. The oils were completely biodegraded at the Tulsa location after 3 years but not at the other sites. Clay content in soil appears to partially control rates of biodegradation. Lead from used crankcase oils was apparently not concentrated in plants growing in oiled plots.

[from Petroleum Abstracts 20(8): #273,227. 1980]

80A-0721

LAND AS A WASTE MANAGEMENT ALTERNATIVE [BOOK REVIEW]

Ross, S.S. 1978.
Chemical Engineering 85(2):14-15.

Wastewaters, Disposal, Waste oil, Land farming, Industries, Book review

The title book [S.S. Ross (ed.). Ann Arbor, Michigan, Ann Arbor Science Publishers, 1978. 811p.] is reviewed. The book examines regulatory, environmental, and health aspects of the land application of various agricultural, municipal and industrial waste materials. The section on industrial wastes includes a paper on the successful land disposal of oily wastewater by means of spray irrigation.

80A-0722

TREATMENT OF OILY WASTES BY ULTRAFILTRATION/REVERSE OSMOSIS - A CASE HISTORY

Sonksen, M.K., F.M. Sittig and E.F. Maziarz. 1979.
Industrial Waste Conference, 33rd, Purdue University, Lafayette, Indiana, 9-11 May 1978. Ann Arbor, Michigan, Ann Arbor Science Publishers Inc., 1979. p.696-705.

Wastewater treatment, Industries, Oil removal, *Ultrafiltration,
*Reverse osmosis

A case history of membrane treatment of oily wastes from the Alcoa Company's Davenport Works is presented. The waste treatment facility "is treating 100,000 gal/day of oily waste, producing a reusable effluent, and is operating with one full-time operator instead of the three men required with the old chemical system."

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
1. Waste Treatment and Disposal Methods

80A-0723

INDUSTRIAL WASTES: PETROLEUM PROCESSING AND COAL CONVERSION WASTES

Stover, E.L. and N.K. Chung. 1979.

Water Pollution Control Federation Journal 51(6):1393-1399.

Wastewater treatment, Solid wastes, Refining, Extraction, Environmental effects

Environmental effects of petroleum processing effluents is the topic of literature reviewed. Technological improvements in wastewater treatment from petroleum processing plants are also reported.

[from Environment Abstracts 9(9): #79-05546. 1979]

80A-0724

DEVELOPMENT OF A LEACHING TEST FOR PETROLEUM WASTES

Systems Technology Corporation. 1978.

Final Report to the American Petroleum Institute. 1978. p.

Waste oil, Disposal, Land farming, Soil, *Leaching test

The title study was conducted to aid in evaluating the potential for groundwater pollution resulting from land disposal of refinery wastes. A primary concern of the test was that it simulated actual field conditions as closely as possible. Two types of test procedures were evaluated: soil column tests and shake tests. It was concluded that a two-column leaching test using a gravel column followed by a soil column using soil from the disposal site is preferable to a shake test. The report is available from Systems Technology Corporation, 245 North Valley Rd., Xenia, OH 45385.

80A-0725

CHARACTERISTICS OF THE MOBILE FIELD USE SYSTEM FOR THE DETOXIFICATION-INCINERATION OF RESIDUALS FROM OIL AND HAZARDOUS MATERIAL SPILL CLEANUP OPERATIONS

Tenzer, R., B. Ford, Jr., W. Mattox and J.E. Brugge. 1979.

Journal of Hazardous Materials 3(1):61-76.

Spill cleanup, Wastewaters, Solid wastes, Incineration, *Detoxification

The Mobile ERIC (Environmental Restoration Incinerator Complex) is a complex thermal and chemical processing plant capable of detoxifying oily and hazardous organic chemical spills and contaminated debris at remote locations throughout the USA. It is designed to handle moderate spills in an efficient manner without undue restriction concerning the physical nature of the input wastes.

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
1. Waste Treatment and Disposal Methods

80A-0726

REMOVAL OF GREASE AND OIL BY BIOLOGICAL TREATMENT PROCESSES

Young, J.C. 1979.

Water Pollution Control Federation Journal 51(8):2071-2088.

Wastewater treatment, Oil removal, Sludge, Industries, Biological treatment

Efficiencies of various wastewater treatment methods in the removal of grease and oil were studied. Types of wastewater treatment plants surveyed included: conventional and complete-mix activated sludge, contact stabilization, Kraus process, extended aeration, oxygen activated sludge, and others. Removal of grease and oil is generally accomplished better by biological treatment plants, than by BOD removal.

[from Environment Abstracts 9(10): #79-05259. 1979]

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
2. Oil-Water Separation

80A-0727

REMOVING OIL FROM WATER

Calvin, D.W. 1979.

US Patent 4,151,078.

Oil-water separation, Sorbents, Oil removal, Patent

In this invention, hydrophobic silica, containing sorbed HF values, is used to remove oil from water by sorption of the oil onto the silica. The silica is recovered from the oil by aqueous treatment in such a manner that the hydrophobicity of the silica is overcome and the silica becomes hydrophilic, therefore releasing the oil.

[from Petroleum Abstracts 19(47): #270,130. 1979]

80A-0728

CHEMICALLY MODIFIED PEAT AS AN ECONOMIC MEANS OF WATER TREATMENT

Smith, E.F., H.B. Mark, Jr. and P. MacCarthy. 1979.

Recent Advances in Environmental Analysis. R.W. Frei (ed.). New York, Gordon and Breach Science Publishers, 1979. p.241-260.

Oil-water separation, Oil removal, Coalescence, Filtration, Sorbents, Product information, *Modified peat

The feasibility of using modified peat as a cation exchanger, anion exchanger and oil coalescer is described. Dried and sulfuric acid-treated peat has been shown to be an effective filtration material for shipboard oil-water separation systems; it could also be used as an oil spill sorbent in fibrous or granular form.

80A-0729

SYSTEM FOR SEPARATING, REMOVING AND RECOVERING CONTAMINANT MATERIALS FROM A BODY OF WATER

Stagemeyer, M.D. and S.F. Allcorn. 1979.

US Patent 4,139,470.

Oil-water separation, Contamination, Equipment, Patent

A system for the title operation utilizes a channeling device to funnel the contaminated water to a skimming apparatus. The skimmer directs the mixture into an attached cylindrical separator which separates the contaminant in an upward direction from the downward discharged water.

[from Petroleum Abstracts 20(10): #273,653. 1980]

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
2. Oil-Water Separation

80A-0730

INDUSTRIAL WASTEWATER CLEANUP

Yehaskel, A. 1979.

Park Ridge, New Jersey, Noyes Data Corporation, 1979. 308p.

Oil-water separation, Wastewaters, Industries, Equipment, Flotation, Filtration, Adsorption, Emulsions

Much of the descriptive information in this book is based on US patents issued since January 1977 dealing with industrial wastewater cleanup. Included is a 37-page section on oil-water separation processes, which describes types of equipment, adsorption and filtration processes, emulsions and liquid membranes, and other separation methods, including gravity and density separation, addition of metal oxides and surfactants, and dissolved air flotation.

3. Waste Oil Reclamation and Reuse

80A-0731

REPROCESSING AND DISPOSAL OF WASTE PETROLEUM OILS

Hess, L.Y. 1979.

Park Ridge, New Jersey, Noyes Data Corporation, 1979. 322p.

Waste oil, Recycling, Refining, Reuse, Disposal, Land farming, Fuel oil, *Combustion

The following topics are detailed: sources and characteristics of waste oils; the re-refining industry and waste oil recovery processes, including descriptions of proprietary processes; disposal practices for waste oils and recovery process residues; combustion of waste oils and use as incinerator fuels; and disposal by land spreading. The information in the book is taken mostly from federally funded studies and patents.

80A-0732

UTILIZATION OF USED OIL

Mascetti, G.J. and H.M. White. 1978.

Aerospace Corporation, Government Support Operations, Aerospace Report No. ATR-78(7384)-1. 53p.

Waste oil, Recycling, Refining, Conservation, Resource management, Industries, Regulations

This report assesses the potential impact of re-refining used automotive and industrial lubricating oils on the national level of petroleum consumption. Re-refining processes are surveyed and evaluated, and factors relevant to re-refining are discussed including used oil characteristics, degradation, quality, and regulatory and institutional barriers to recycling.

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
3. Waste Oil Reclamation and Reuse

80A-0733

WASTE OIL RECYCLING

Reindl, J. 1977.

Journal of Environmental Health 40(1):52-55.

Refining, Waste oil, Disposal, Crankcase oil, Reclamation, Recycling

This article is a general review of waste oil generation in the US (about 1.1 billion gals per year), of the resultant contamination of the freshwater aquatic environment, and of alternatives to current waste oil disposal practices. The re-refining and recycling of used lubricant oils is now feasible in many locations, due to recent increases in oil prices.

80A-0734

AN ISSUE SUPPORT PAPER ABOUT WASTE OIL RECYCLING

US Department of the Interior. Bureau of Mines. n.d.

US Department of Interior Issue Paper. 41p.

Waste oil, Disposal, Reclamation, Refining, Reuse, Government agencies, Legislation, *Bureau of Mines

Because of legislative and economic disincentives, there is little waste oil recycling and reuse in the US, and as a consequence, about 1 billion gallons of waste automotive and industrial oils are wasted or dumped each year. This paper addresses the need for reclamation and recycling of used oil, discusses the role which the Federal Government should have in promoting oil reuse, and outlines a Bureau of Mines research and development program for effectively recycling waste oils.

4. Legal and Regulatory Aspects

80A-0735

RECENT FEDERAL AND STATE LEGISLATIVE DEVELOPMENTS IN USED OIL RECYCLING

Irwin, W.A. and K. Heimann. 1978.

Environmental Policy and Law 4(1):30-36.

Waste oil, Recycling, Disposal, Regulations, Legislation, US, California, *Minnesota, *Utah

US federal and state legislation governing collection, recycling and disposal of used oil has developed dramatically in recent years. This article summarizes the existing pertinent federal legislation, currently pending bills in Congress, and state initiatives, already enacted or under consideration. Legislation enacted in California, Minnesota, and Utah is examined.

G. PETROLEUM & PETROCHEMICAL INDUSTRY WASTE TREATMENT & DISPOSAL
4. Legal and Regulatory Aspects

80A-0736

LEGISLATION AND REGULATION OF WASTE OIL DISPOSAL

Mitchell, H. 1977.

Environmental Policy and Law 3(1):27.

Waste oil, Disposal, Regulations, Legislation, Recycling, Reuse,
Germany, France, Denmark, UK, Italy, US

West Germany is the first country to deal, in 1968, comprehensively with waste oil recycling and its regulations have been praised as a model for other countries to follow. This article briefly reviews policies of France, Denmark, Italy, UK, and the US as regards oil recycling and reuse.

H. MISCELLANEOUS PUBLICATIONS

80A-0737

EVALUATION OF IN VITRO ENZYME INHIBITION FOR SCREENING PETROLEUM EFFLUENTS

Armant, D.R., A.L. Buikema, Jr., C.L. Rutherford and J. Cairns, Jr. 1980.

Bulletin of Environmental Contamination and Toxicology 24(2):244-250.

Toxicity, Wastewaters, Refineries, Biological effects, *Toxicity testing

"The purpose of this research was two fold: (a) to determine if in vitro inhibition of glucose-6-phosphate dehydrogenase (G6PDH) can be used to predict toxicity of actual refinery effluents, and (b) to determine how inhibition of G6PDH varies as the components of an artificial refinery mixture (ARM) vary." The application of this method requires additional development and at present, cannot replace traditional toxicity testing necessary to document environmental hazards.

80A-0738

GULF UNDERWATER FLARE EXPERIMENT (GUFEX): EFFECTS OF HYDROCARBONS ON PHYTOPLANKTON

Brooks, J.M., G.A. Fryxell, D.F. Reid and W.M. Sackett. 1977. Pollutant Effects on Marine Organisms. C.S. Giam (ed.). Lexington, Mass., D.C. Heath and Company, 1977. p.45-75. Proceedings.

Hydrocarbons, Biological effects, Phytoplankton, Marine environment, Biomass, *GUFEX experiment

"The concentrations of hydrocarbons in the vicinity of two underwater vents observed were not high enough to produce any apparent effect on planktonic biomass or viability except possibly in the immediate vicinity of the vent. The title experiments did not demonstrate that underwater venting of hydrocarbon gases is having any effect on phytoplankton productivity or viability." [possibly oil pollution related]

[from Marine Pollution Research Titles 5(11): #1894. 1978]

80A-0739

SELECTED BIBLIOGRAPHY ON STUDIES AND RESEARCH RELEVANT TO POLLUTION IN THE MEDITERRANEAN

Calamari, D. 1977.

FAO Fisheries Technical Paper 165. 100p.

Bibliographies, Mediterranean Sea, Monitoring, Contamination

"This bibliography provides participating research centers with selected references from the Mediterranean relevant to the various aspects of the research and monitoring projects. The organisms and pollutants to be monitored are specified and the general principles for the research projects are outlined." [possibly oil pollution related]

[from Oceanic Abstracts 15(4): #78-05934. 1978]

H. MISCELLANEOUS PUBLICATIONS

80A-0740

RESULTS OF THE BALTIC INTERCALIBRATION WORKSHOP, KIEL, MARCH 1977.
REPORT OF GROUP 3

Ehrhardt, M. 1977.

International Committee for Exploration of the Sea, ICES C.M. Pap.
Rep., Report No.C.M.1977/C:4. p.41-46.

Chemical analysis, Detection, Physical aspects, Hydrocarbons,
*Intercalibration workshop

Summary not available. [possibly oil pollution related]

[from A Bibliography on Marine and Estuarine Oil Pollution.
D.S. Moulder and A. Varley. Plymouth, UK, Marine Pollution
Information Centre, 1979. Supplement 3:9, #3540. 1979]

80A-0741

ON THE HYPOTHESIS OF A RELATIONSHIP BETWEEN DINOFLAGELLATE BLOOMS
AND THE 'AMOCO-CADIZ' OIL SPILL

Le Fevre, J. 1979.

Journal of Marine Biological Association 59(2):525-527.

Amoco Cadiz spill, France, Coasts, *Dinoflagellate blooms

Dinoflagellate blooms occurred repeatedly along coastal France and
a possible relationship between these and the earlier Amoco Cadiz
spill was hypothesized. This study concludes that "...there is no
relationship between dinoflagellate blooms and oil pollution. There
appears to be, however, a positive correlation between large tanker
wrecks and reports of blooms making their way to the media, but this
is probably because much more attention is paid by more people to
what happens at sea whenever such a disaster occurs."

80A-0742

INTERCOMPARISON OF NISKIN AND BLUMER SAMPLERS FOR THE STUDY OF
DISSOLVED AND DISPERSED PETROLEUM RESIDUES IN SEAWATER

Levy, E.M. 1979.

Journal of the Fisheries Research Board of Canada 36(12):1513-1516.

Sampling, Solubility, Dispersion, Concentrations, Hydrocarbons, Sea-
water, *Niskin vs. Blumer samplers

"A comparison of the data from Niskin and Blumer contamination-free
samplers regarding the concentration of dissolved and dispersed
petroleum residues in seawater demonstrated that equivalent informa-
tion may be obtained if the appropriate procedures are used."

H. MISCELLANEOUS PUBLICATIONS

80A-0743

NEWSPAPERS AND THE COASTAL OIL SPILL HAZARD

Needham, R. 1979.

Alternatives 8(2):21-28.

Oil spills, Coastal waters, Information systems, *Newspaper coverage

The quality and quantity of news coverage of four coastal oil spills is analyzed. Thirteen Canadian and U.S. newspapers were used in the study. The circulation areas of the newspapers center around Lake Erie.

[from Environment Abstracts 9(10): #79-05932. 1979]

80A-0744

USE OF OIL SORBENT MATERIALS FOR SMALL HERBICIDE SPILLS

Scott, W.S. 1979.

Bulletin of Environmental Contamination and Toxicology 23(1/2):123-128.

Absorption, Sorbents, Vegetation, Marshes, *Oily herbicide spills

Herbicide sprays using oil as the carrier have become widespread to selectively control unwanted vegetation. This study investigated the feasibility of using oil sorbent materials to soak up herbicide, as well as oil, in the event of spillage in a swamp or other wetland.

80A-0745

ENVIRONMENTAL HAZARDS: CONSIDERATIONS FOR OUTER CONTINENTAL SHELF DEVELOPMENT

Teleki, P.G., L.E. Garrison and M.A. Hampton. 1979.

Offshore Technology Conference, 11th, Houston, Texas, 30 April-3 May 1979. Vol 2:2579-2589.

Offshore, OCS, Development, Safety, Risk analysis, Atlantic Coast, Pacific Coast, US, Alaska, *Environmental hazards

A summary of environmental hazards on the US Continental Shelf is presented to show the great variability in the hazard potential among OCS areas and complex interactions among various types of hazards within a single area. Covered are slope stability and properties of marine sediments, extreme wave conditions, seismicity and faulting, and arctic sea ice and permafrost. [possibly oil pollution related]

H. MISCELLANEOUS PUBLICATIONS

80A-0746

IRON REQUIREMENT OF OIL DEGRADING BACTERIA FROM THE WESTERN GULF OF MEXICO

Van Auken, O.W. and A.G. Kaster. 1978.

American Society for Microbiology, 78th Annual Meeting, Las Vegas, Nevada, 1978. R. Slepecky (ed.). Washington, DC, American Society for Microbiology, 1978. p.208. Abstract No.Q78.

Biodegradation, Bacteria, Gulf of Mexico, *Iron requirements

Iron requirements of naturally occurring oil degrading bacteria from the title area were investigated, and the use of iron in estimating the populations is discussed. "The incorporation of FeCl_3 into media used for the successful enumeration of oil degrading bacteria is essential for population estimation."

80A-0747

THE POLLUTION CONCEPT IN INTERNATIONAL LAW

Van Heijnsbergen, P. 1979.

Environmental Policy and Law 5(1):11-13.

Contaminants, *Pollution, *Definition

This article examines the various definitions and meanings of the term pollution, as it is used in international law. The term, in different contexts, incorporates the concepts "environmentally harmful activities", "environmental impairment", and "deterioration". Physical contamination resulting from a discharge of oil is used as an illustrative example of pollution damage.

80A-0748

THE AMOCO CADIZ OIL SPILL. A SUMMARY OF OBSERVATIONS MADE BY U.S. SCIENTISTS 23 MARCH-10 MAY, 1978.

Wolfe, D.A. 1978.

Marine Pollution Bulletin 9(11):288-292.

Amoco Cadiz spill, France, US, *Research review

This article summarizes the observations made by a team of United States scientists during the two months immediately after the grounding of the title ship. The majority of information has been abstracted from the NOAA/EPA preliminary scientific report.

H. MISCELLANEOUS PUBLICATIONS

80A-0749

THE MARINE LIFE OF AN OFFSHORE OIL PLATFORM

Wolfson, A., G. Van Blaricum, N. Davis and G.S. Lewbel. 1979.
Marine Ecology-Progress Series, Vol 1:81-89.

Marine organisms, Distribution, Platforms, Coastal waters, Offshore, Habitats, California

This article reports on research conducted at Union Oil Platform EVA, off Huntington Beach, California to understand how such structures affect and modify the surrounding marine environment. Underwater surveys were conducted to determine: (1) the distribution, standing stock and productivity of attached fouling organisms, (2) the density, size-structure, and biomass of epibenthic populations beneath the platform, and (3) the abundance, species composition and distribution of epifaunal and infaunal benthos as a function of distance from the platform. A number of unique distributional patterns and interactions among communities are described and discussed.

80A-0750

GUT-ASSOCIATED MICROFLORA OF LIMNORIA TRIPUNCTATA IN MARINE CREOSOTE-TREATED WOOD PILINGS

Zachary, A. and R.R. Colwell. 1979.
Nature 282(5740):716-717.

Uptake, Hydrocarbons, Metabolism, Bacteria, *Creosote-treated pilings, *Isopods, *Limnoria tripunctata

Isopods from creosote-treated wood pilings appear to contain a resident gut microflora, whereas isopods from untreated pilings do not. It is possible that the gut-associated bacteria take up and utilize the creosote hydrocarbons, thereby contributing to the creosote resistance attributed to L. tripunctata. [possibly oil pollution related]

Guide to the Master List of Keywords and the Subject Keyword Index

The following Master List of Keywords is a controlled list of approximately 400 scientific, technical, geographic, and other descriptive terms relevant to the field of oil pollution. For each literature abstract and research project summary contained in this issue, a string of several terms has been selected from this list to serve as a reference guide to each entry. The Master List is continually updated to reflect common word usage and current trends in oil pollution literature and research. When necessary, additional free-language terms are assigned to more thoroughly define the subject coverage of an entry; such terms are preceded by an asterisk (*).

The terms included in the Master List are alphabetically permuted by computer to form the Subject Keyword Index. Thus, the string of keywords for each abstract is listed in all possible alphabetical arrangements to provide rapid access to, and cross-referencing of, any entry in this issue. The free-language terms (*) are not alphabetically permuted.

To effectively use the permuted Subject Keyword Index, the reader should use the following procedure: 1) Scan the Master List of Keywords and Cross-Reference Guide to determine all possible terms and word variants applicable to the topic of interest; 2) look up all terms in the permuted Subject Keyword Index and scan the other keywords in each entry to determine the relevancy of the entry; 3) note the citation numbers of relevant entries and locate them in the body of the ABSTRACTS.

MASTER LIST OF KEYWORDS
AND CROSS-REFERENCE GUIDE
TO RELATED TERMS

S: See

SA: See also

Absorption

SA: Adsorption, Sorbents

Activated sludge

SA: Biological treatment,
Sludge, Solid wastes

Acute effects

SA: Biological effects,
Mortality, Toxicity

Adsorption

SA: Absorption, Sorbents

Africa

Air-Sea interface

S: Sea surface

Alabama

Alaska

SA: Gulf of Alaska

Algae

SA: Phytoplankton

Amoco Cadiz spill

SA: France

Analytical techniques

SA: Bioassay, Chemical anal-
ysis, Chromatography, Concen-
trations, Detection, GC/MS,
Source identification,
Spectrometry, Spectroscopy

Animals

SA: Birds, Invertebrates,
Marine mammals, Marine organ-
isms, Vertebrates, Wildlife

Annelids

SA: Invertebrates, Marine
organisms, Polychaetes

Antarctica

API (American Petroleum
Institute)

Aquatic environment

SA: Freshwater, Lakes, Marine
environment, Rivers, Sea
surface

Arctic

SA: Ice, Subarctic regions

Arctic Ocean

Argentina

Argo Merchant spill

Aromatic hydrocarbons

SA: Hydrocarbons, PAH

Atlantic coast

Atlantic Ocean

Australia

Bacteria

SA: Microorganisms

Bahamas

Ballast

Baltic Sea

SA: Segregated ballast, Tank-
ers, Wastewater treatment

Barents Sea

Baseline studies

SA: EIS

Bays

SA: Coastal waters,
Estuaries, Harbors

Beach cleanup

SA: Spill cleanup

Beaches

SA: Coasts, Intertidal zone,
Sediments, Shorelines

Beaufort Sea

Behavior

SA: (Physical) Dispersion,
Drift, Fate, Models, Move-
ment, Predictions, Simula-
tions, Spreading
SA: (Biological) Bioassay,
Biological effects, Develop-
ment, Growth, Toxicity

Benthos

SA: Invertebrates, Marine
organisms

Bering Sea

Bermuda

Bibliographies

Bilges

S: Ballast, Ships, Tankers

Bioassay

SA: Analytical techniques

Biodegradation

SA: Bacteria, Microorganisms

Biogenic hydrocarbons
 SA: Hydrocarbons
 Bioindicators
 SA: Detection
 Biological effects
 SA: Acute effects, Chronic effects, Sublethal effects, Toxicity
 Biological treatment
 SA: Wastewater treatment
 Biomass
 Birds
 SA: Animals, Vertebrates, Wildlife
 Black Sea
 SA: USSR
 BLM (Bureau of Land Management)
 SA: Government agencies, US government
 Blowout prevention
 Blowouts
 Book review
 Booms
 SA: Design-engineering, Equipment, Spill containment
 Bouchard 65 spill
 SA: Buzzards Bay
 Brazil
 Burning
 SA: Incineration
 Buzzards Bay
 SA: Massachusetts
 California
 SA: Pacific coast
 Canada
 Carcinogens
 SA: Health hazards, Mutagens, PAH
 Caribbean Sea
 Caspian Sea
 SA: USSR
 Chemical analysis
 SA: Analytical techniques, Chromatography, Detection, GC/MS, Source identification, Spectrometry, Spectroscopy
 Chemical effects
 Chesapeake Bay
 SA: Delaware, Maryland
 Chile
 China
 Chromatography
 SA: Analytical techniques, Chemical analysis, GC/MS
 Chronic effects
 SA: Biological effects, Toxicity
 Coalescence
 SA: Flocculation, Wastewater treatment
 Coastal waters
 SA: Atlantic coast, Bays, Coasts, Harbors, Pacific coast
 Coastal zone management
 SA: Environmental management, Resource management
 Coasts
 SA: Bays, Beaches, Coastal waters, Harbors, Ports, Shorelines
 Cold Climates
 SA: Arctic, Arctic Ocean, Subarctic regions
 Compensation
 SA: Insurance, Liability
 Concentrations
 SA: Analytical techniques, Chemical analysis, Chromatography, Detection
 Connecticut
 Conservation
 SA: Coastal zone management, Environmental management, Resource management
 Containment
 S: Booms, Equipment, Spill cleanup, Spill containment
 Contamination
 Contingency planning
 SA: Spill cooperatives, Spill response
 Coral reefs
 Cost analysis
 SA: Economics, Economic effects
 Crankcase oil
 SA: Lubricating oil
 Crude oil
 SA: Aromatic hydrocarbons, Hydrocarbons
 Crude oil washing
 SA: Ballast, Oil discharges, Segregated ballast, Tankers
 Crustaceans
 SA: Invertebrates, Marine organisms
 Deepwater ports

Degradation
 SA: Biodegradation
 SA: Harbors, Oil terminals, Ports
 Delaware
 Delaware Bay
 Demulsification
 Denmark
 Depuration
 SA: Uptake
 Design-engineering
 SA: Equipment, Patent, Performance testing, Product information
 Detection
 SA: Analytical techniques, Bioindicators, Chemical analysis, Monitoring, Remote sensing, Source identification, Surveillance
 Development
 SA: (Oil) Drilling, Exploration, Offshore, Production;
 SA: (Biological) Behavior, Biological effects, Growth, Metabolism
 Diesel fuel
 S: Fuel oil
 Dispersants
 SA: Emulsifiers, Spill cleanup, Surfactants
 Dispersion
 SA: Behavior, Drift, Movement, Spreading
 Disposal
 SA: Waste oil, Wastewaters
 Distribution
 SA: Concentrations, Hydrocarbons
 DOE (Department of Energy)
 SA: Government agencies, US government
 Drift
 SA: Behavior, Dispersion, Models, Movement, Simulations, Spreading
 Drilling
 SA: Exploration, Offshore, Oil fields, Oil wells, Platforms
 Echinoderms
 S: Invertebrates, Marine organisms
 Economic effects
 SA: Socioeconomic effects
 Economics
 SA: Cost analysis
 Ecosystems
 SA: Food web, Habitats, Niches
 Ecuador
 Effluents
 S: Wastewaters
 Effluent treatment
 S: Wastewater treatment
 EIS (Environmental Impact Statement)
 SA: Baseline studies
 Ekofisk blowout
 Emulsification
 SA: Dispersants, Surfactants
 Emulsions
 Engineering
 S: Design-engineering
 England
 S: UK
 English Channel
 Environmental effects
 Environmental Impact Statement
 S: Baseline studies, EIS
 Environmental management
 S: Coastal zone management, Resource management
 Environmental protection
 S: Pollution control, Pollution prevention
 EPA (Environmental Protection Agency)
 SA: Government agencies, US government
 Equipment
 SA: Booms, Patents, Product information, Skimmers, Spill cleanup
 ERDA (Energy Research and Development Administration)
 SA: DOE, Government agencies, US government
 Estuaries
 SA: Bays
 Europe
 Evaporation
 Exploration
 SA: Development, Drilling, Offshore, Production

Extraction	GC/MS (Gas chromatography/Mass spectrometry)
SA: Oil shale, Production, Tar sands	SA: Analytical techniques, Chemical analysis, Chromatography, Spectrometry
Fate	Georges Bank
SA: Behavior, Drift, Spreading	SA: Atlantic Ocean, OCS
FEA (Federal Energy Administration)	Georgia
SA: DOE, ERDA, Government agencies, US government	Germany
Field testing	Government agencies
S: Performance testing	SA: BLM, DOE, EPA, ERDA, FEA, NOAA, USCG, USGS, USN; Foreign governments, State governments, US government
Filtration	Gravity separation
SA: Flocculation, Wastewater treatment	SA: Oil-water separation, Wastewater treatment
Fingerprinting	Great Britain
S: Source identification	S: UK
Finland	Great Lakes
Fish	Greenland
SA: Vertebrates, Marine organisms	Groundwater
Fisheries	SA: Freshwater, Water quality
Flocculation	Growth
SA: Coalescence, Filtration, Wastewater treatment	SA: Behavior, Development, Metabolism
Florida	Guidelines
Florida spill	SA: Manuals, Regulations
Flotation	Gulf of Alaska
SA: Oil-water separation, Wastewater treatment	SA: Alaska
Food chain	Gulf of Mexico
S: Food web	SA: Mexico
Food web	Habitats
Foreign governments	SA: Ecosystems
SA: Government agencies	Harbors
Fossil fuels	SA: Bays, Coastal waters, Deepwater ports, Oil terminals, Ports
SA: Crude oil	Health hazards
France	SA: Carcinogens
Freshwater	Hydrocarbons
SA: Groundwater, Lakes, Rivers, Water quality	SA: Aromatic hydrocarbons, Biogenic hydrocarbons, Crude oil, PAH, WSF
Fuel oil	Ice
Fuels	SA: Arctic, Subarctic regions
S: Fossil fuels, Fuel oil, Gasoline, Petroleum products	Illinois
Fungi	IMCO (International Maritime Consultative Organization)
SA: Microorganisms	SA: International agreements
Gas-liquid chromatography	Incineration
S: Chemical analysis, Chromatography	SA: Burning, Waste oil treatment
Gasoline	
SA: Fuel oil	

India
 Indian Ocean
 Indonesia
 Industries
 SA: Oil industry, Petrochemicals
 Information systems
 Infrared spectroscopy
 S: Analytical techniques, Spectroscopy
 Insurance
 SA: Compensation, Liability
 International agreements
 SA: Foreign governments
 International conventions
 SA: Foreign governments, Legislation, Regulations
 Intertidal zone
 SA: Beaches, Coastal Waters, Shorelines
 Invertebrates
 SA: Benthos, Crustaceans, Echinoderms, Marine organisms, Mollusks
 Iran
 Ireland
 SA: UK
 Israel
 Italy
 Ixtoc 1 blowout
 SA: Gulf of Mexico, Mexico
 Japan
 Kuwait
 Labrador Sea
 Lakes
 SA: Freshwater, Great Lakes
 Land farming
 SA: Waste oil disposal
 Land spills
 SA: Leakage, Onshore, Onshore impacts, Pipelines
 Law enforcement
 SA: Legislation, Regulations, Surveillance
 Leakage
 SA: Oil discharges
 Legislation
 SA: International conventions, Law enforcement Regulations
 Liability
 SA: Compensation, Insurance, Law enforcement
 Lightering
 S: Oil transfer, Ships, Tankers
 Louisiana
 Lubricating oil
 SA: Crankcase oil
 Maine
 Manuals
 SA: Guidelines
 Marine environment
 SA: Offshore, Sea surface, Seawater
 Marine mammals
 SA: Animals, Vertebrates, Wildlife
 Marine organisms
 SA: Animals, Annelids, Crustaceans, Echinoderms, Fish, Invertebrates, Microorganisms, Mollusks, Vertebrates
 Marshes
 Maryland
 Massachusetts
 Mass spectrometry
 S: GC/MS, Spectrometry
 Mass spectroscopy
 S: Spectroscopy
 Mediterranean Sea
 Metabolism
 SA: Depuration, Growth, Uptake
 Metula spill
 SA: Strait of Magellan
 Mexico
 SA: Gulf of Mexico
 Michigan
 SA: Great Lakes
 Microorganisms
 SA: Algae, Bacteria, Biodegradation, Fungi, Yeasts
 Mississippi
 Mississippi River
 Models
 SA: Behavior, Predictions, Simulations, Spill trajectories
 Mollusks
 SA: Invertebrates, Marine organisms
 Monitoring
 SA: Detection, Remote sensing, Sampling, Surveillance
 Mortality
 SA: Acute effects, Toxicity

Motor oil
 S: Crankcase oil
 Mousse
 S: Emulsions, Emulsification
 Movement
 SA: Behavior, Drift, Spreading
 Mutagens
 SA: Carcinogens, Health hazards
 Narragansett Bay
 SA: Rhode Island
 Natural seepage
 SA: Santa Barbara Channel
 New Jersey
 New York
 Niches
 S: Ecosystems, Habitats
 NOAA (National Oceanic and Atmospheric Administration)
 SA: Government agencies, US government
 North Carolina
 North Sea
 Norway
 Oceans
 S: Arctic Ocean, Atlantic Ocean, Indian Ocean, Marine environment, Pacific Ocean
 OCS (Outer Continental Shelf)
 SA: Development, Drilling, Exploration, Offshore, Oil fields, Oil-gas leasing, Production
 Offloading
 S: Oil transfer, Ships, Tankers
 Offshore
 SA: Development, Drilling, Exploration, OCS, Oil fields, Oil-gas leasing, Oil wells, Platforms, Production
 Oil
 S: Crankcase oil, Crude oil, Fossil fuels, Fuel oil, Lubricating oil, Oil shale, Petroleum products, Residual oils, Tar, Tar sands, Waste oil, WSF
 Oil discharges
 SA: Leakage
 Oil fields
 SA: Offshore, Platforms, Production
 Oil-gas leasing
 SA: Development, Drilling, OCS, Offshore, Production
 Oil industry
 SA: Industries, Petrochemicals, Refineries
 Oil removal
 SA: Pollution control, Spill cleanup, Spill removal
 Oil sands
 S: Tar sands
 Oil shale
 SA: Extraction
 Oil slicks
 Oil spills
 SA: Spill cleanup, Spill containment, Spill disposal, Spill removal, Spill response
 Oil tanks
 SA: Storage
 Oil terminals
 SA: Deepwater ports, Harbors, Oil transfer, Ports
 Oil transfer
 SA: Harbors, Ports
 Oil transport
 SA: Pipelines, Tankers
 Oil-water separation
 SA: Gravity separation, Waste oil treatment, Wastewater treatment
 Oil wells
 SA: Drilling, Offshore, Oil fields, Production
 Olympic Games spill
 Onshore
 SA: Land spills
 Onshore impacts
 Oregon
 Oxidation
 SA: Biodegradation, Weathering
 Pacific coast
 Pacific Ocean
 PAH (Polycyclic aromatic hydrocarbons)
 SA: Aromatic hydrocarbons, Hydrocarbons
 Patent
 SA: Design-engineering, Equipment
 Pennsylvania

Performance testing	Product information
SA: Design-engineering,	SA: Design-engineering,
Equipment, Product information	Equipment, Performance
Persian Gulf	testing
Personnel training	Production
SA: Contingency planning,	SA: Development, Drilling,
Spill response	Exploration, Offshore
Petrochemicals	Prudhoe Bay
Petroleum	SA: Alaska, Gulf of Alaska
S: Hydrocarbons, Petroleum	Puerto Rico
products	Puget Sound
Petroleum industry	SA: Washington
S: Oil industry, Refineries	Reclamation
Petroleum products	SA: Recycling, Reuse
SA: Crankcase oil, Fuel oil,	Recovery
Fuels, Gasoline, Lubricating	SA: Restoration
oil	Recycling
Philippines	SA: Reclamation, Reuse
Physical aspects	Red Sea
Physical effects	Refineries
SA: Behavior, Drift,	SA: Oil industry
Movement	Refining
Phytoplankton	Regulations
SA: Algae, Microorganisms,	SA: Government agencies,
Plankton	Guidelines, International
Pipelines	agreements, International
SA: Oil transfer, Oil trans-	conventions, Legislation
port, Trans-Alaska Pipeline	Release
Plankton	S: Depuration
S: Microorganisms, Phyto-	Remote sensing
plankton, Zooplankton	SA: Detection, Monitoring,
Plants	Source identification,
SA: Vegetation	Surveillance
Platforms	Reproduction
SA: Drilling, Exploration,	Residual oils
Offshore, Production, Oil	S: Tar, Waste oil
wells	Resource management
Pollution control	SA: Coastal zone management
Pollution prevention	Restoration
SA: Environmental protection,	SA: Recovery
Contingency planning	Reuse
Polychaetes	SA: Reclamation, Recycling
S: Annelids, Invertebrates,	Rhine River
Marine organisms	SA: Germany, Mediterranean Sea
Ports	Rhode Island
SA: Deepwater ports, Harbors,	Risk analysis
Oil terminals	SA: Economics, Statistical
Portugal	analysis, Statistics
Predictions	Rivers
SA: Models, Simulations,	SA: Freshwater, Onshore
Spill trajectories	Russia
	S: USSR

Safety	Source identification
SA: Health hazards	SA: Detection, Monitoring,
Sampling	Remote sensing, Sampling,
SA: Detection, Monitoring,	Surveillance
Source identification	Sources
San Francisco Bay	South Carolina
SA: California	Soviet Union
Sansinena spill	S: USSR
Santa Barbara Channel	Spain
SA: California	Spectrometry
Sargasso Sea	SA: Analytical techniques,
S: Atlantic Ocean	Chemical analysis, GC/MS
Scotland	Spectroscopy
SA: UK	SA: Analytical techniques,
Seabirds	Chemical analysis
S: Birds	Spill cleanup
Sea surface	SA: Booms, Dispersants,
Seawater	Equipment, Pollution control,
SA: Marine environment,	Sinking agents, Skimmers,
Sea surface	Spill containment
Sedimentation	Spill containment
Sediments	Spill cooperatives
SA: Soil	SA: Contingency planning,
Segregated ballast	Spill cleanup, Spill response
SA: Ballast, Crude oil	Spill disposal
washing, Tankers	Spill removal
Ships	Spill response
SA: Tankers	SA: Contingency planning,
Shorelines	Spill cleanup, Spill cooper-
SA: Beaches, Coasts	atives
Simulations	Spill trajectories
SA: Models, Predictions	SA: Drift, Models, Movement,
Sinking agents	Predictions
Skimmers	Spreading
SA: Design-engineering,	SA: Behavior, Drift, Models,
Equipment, Spill cleanup	Movement, Oil slicks
Sludge	St. Lawrence River
SA: Activated sludge, Solid	SA: Great Lakes
wastes	State governments
Socioeconomic effects	SA: Government agencies,
SA: Economic effects	Regulations
Soil	Statistical analysis
SA: Sediments	Statistics
Solid wastes	Storage
SA: Disposal, Sludge	SA: Oil tanks
Solubility	Strait of Magellan
Solution	SA: Chili
Solvents	Strategic Petroleum Reserve
S: Dispersants, Emulsifiers	Streams
Sorbents	S: Freshwater, Onshore,
SA: Absorption, Adsorption	Rivers

Subarctic regions	USN (US Navy)
SA: Arctic, Cold climates	USSR (Union of Soviet Socialist Republics)
Sublethal effects	Vegetation
SA: Biological effects,	SA: Plants
Toxicity	Venezuela
Superports	Vertebrates
S: Deepwater ports, Oil terminals, Ports	SA: Animals, Birds, Marine mammals, Marine organisms
Supertankers	Virgin Islands
S: Tankers	Virginia
Surfactants	Washington
SA: Dispersants, Emulsifiers	Waste oil
Surveillance	SA: Disposal, Reclamation, Recycling, Residual oils
SA: Law enforcement, Monitoring, Remote sensing	Waste oil treatment
Sweden	Wastewaters
Tainting	Wastewater treatment
S: Contamination	SA: Oil-water separation
Tank farms	Waterfowl
S: Oil tanks, Storage	S: Birds
Tankers	Water quality
SA: Oil transport, Ships	SA: Freshwater, Groundwater
Tar	Water soluble fraction
SA: Residual oils	S: WSF
Tar sands	Weathering
Testing	Wildlife
S: Performance testing	SA: Animals, Birds, Marine organisms, Marine mammals
Texas	WSF (Water soluble fraction)
Torrey Canyon spill	SA: Crude oil, Hydrocarbons, Solution
Toxicity	Yeasts
SA: Acute effects, Biological effects	SA: Microorganisms
Trans-Alaska Pipeline	Zooplankton
SA: Alaska, Pipelines	SA: Microorganisms, Plankton
Tropical regions	
UK (United Kingdom)	
Ultrafiltration	
S: Filtration	
UN (United Nations)	
SA: International agreements, International conventions	
Uptake	
SA: Depuration, Growth, Metabolism	
Urquiola spill	
SA: Spain	
US (United States)	
USCG (US Coast Guard)	
US Government	
SA: Government agencies	
USGS (US Geological Survey)	
SA: Government agencies, US government	

0148 ABSORPTION, SORBENTS, OIL REMOVAL, PATENT, *COIR DUST
 0163 " SPILL REMOVAL, SORBENTS, PATENT, *PERLITE
 0345 " SORBENTS, PRODUCT INFORMATION, PERFORMANCE TESTING, TOXICITY, MARINE ORGANISMS
 0412 " ADSORPTION, CONTAMINATION, FRESHWATER, SEDIMENTS, RIVERS, LAKES, AROMATIC
 HYDROCARBONS
 0714 " WASTEWATER TREATMENT, REFINERIES, FILTRATION, *ACTIVATED CARBON
 0716 " WASTEWATER TREATMENT, OIL REMOVAL, CONTAMINATION, EMULSIONS
 0744 " SORBENTS, VEGETATION, MARSHES, *OILY HERBICIDE SPILLS
 0705 ACTIVATED SLUDGE, WASTEWATER TREATMENT, REFINERIES, SOLID WASTES, *ACTIVATED CARBON
 0706 " WASTEWATER TREATMENT, REFINERIES, SOLID WASTES, *ACTIVATED CARBON
 0707 " WASTEWATER TREATMENT, REFINERIES, SOLID WASTES, *ACTIVATED CARBON
 0260 ACUTE EFFECTS, CRUDE OIL, BENTHOS, BACTERIA, GROWTH, CHRONIC EFFECTS, OCS, TEXAS
 0276 " PETROCHEMICALS, TOXICITY, FISH, HYDROCARBONS, *GOLDFISH
 0288 " HYDROCARBONS, CHRONIC EFFECTS, TOXICITY, MORTALITY, BIRDS, WILDLIFE, ANALYTICAL
 TECHNIQUES
 0294 " CRUDE OIL, BIRDS, REPRODUCTION, *FOOD INTAKE
 0319 " HYDROCARBONS, CRUDE OIL, PHYTOPLANKTON, *PHOTOSYNTHESIS, *RESPIRATION
 0324 " METABOLISM, BIOLOGICAL EFFECTS, FISH, STATISTICAL ANALYSIS
 0343 " MARINE ORGANISMS, FUEL OIL, BALTIC SEA, COASTAL WATERS, *TSEIS SPILL
 0347 " CRUDE OIL, DISPERSANTS, FISH, *SALMO GAIARDNERI, *SERUM GLUCOSE AND SODIUM, *GILL
 MORPHOLOGY
 0353 " UPTAKE, DEPURATION, FISH, PAH, CHRONIC EFFECTS, *ACCUMULATION, *RAINBOW TROUT,
 *NAPHTHALENE
 0356 " MARINE ORGANISMS, CONTAMINATION, OIL SPILLS, CHRONIC EFFECTS
 0381 " FISH, GULF OF ALASKA, *PACIFIC HERRING ROE
 0398 " SUBLETHAL EFFECTS, MARINE ORGANISMS, FATE, HYDROCARBONS, ESTUARIES, REFINERIES,
 WASTEWATERS
 0447 " CHRONIC EFFECTS, TOXICITY, UPTAKE, DEPURATION, METABOLISM, ORGANISMS, ALASKA,
 HYDROCARBONS, BASELINE STUDIES
 0512 " ENVIRONMENTAL EFFECTS, BEHAVIOR, SEDIMENTATION, COASTS, AMOCO CADIZ SPILL
 0146 ADSORPTION, SPILL CLEANUP, SORBENTS, PATENT, *FIBER MATS
 0154 " SPILL CLEANUP, DESIGN-ENGINEERING, PERFORMANCE TESTING, EQUIPMENT
 0170 " OIL-WATER SEPARATION, WASTEWATER TREATMENT, SORBENTS, PATENT, *KAPOK FIBERS
 0407 " AROMATIC HYDROCARBONS, WASTEWATER TREATMENT, *ACTIVATED CARBON
 0408 " DISPERSANTS, BEACHES, SEDIMENTS, CRUDE OIL, CONTAMINATION
 0412 " ABSORPTION, CONTAMINATION, FRESHWATER, SEDIMENTS, RIVERS, LAKES, AROMATIC
 HYDROCARBONS
 0435 " HYDROCARBONS, OCS, ALASKA, PHYSICAL EFFECTS, FATE, *SUSPENDED MATTER
 0730 " OIL-WATER SEPARATION, WASTEWATERS, INDUSTRIES, EQUIPMENT, FLOTATION, FILTRATION,
 EMULSIONS
 0065 AFRICA, MONITORING, TAR, DISTRIBUTION, SAMPLING, CONCENTRATIONS
 0073 " SAMPLING, SPECTROMETRY, SEDIMENTS, MONITORING
 0432 ALABAMA, BASELINE STUDIES, MISSISSIPPI, FLORIDA, OCS, *MAPLA SURVEY
 0433 " BASELINE STUDIES, MISSISSIPPI, FLORIDA, OCS, *MAPLA SURVEY
 0349 ALASKA, SUBLETHAL EFFECTS, PLANTS, *SEAGRASS PHOTOSYNTHESIS
 0385 " CRUDE OIL, BIOLOGICAL EFFECTS, BACTERIA, FUNGI, SOIL, *HOT OIL, *TAIGA SOIL
 0409 " SEDIMENTATION, COASTS, OIL SPILLS, *COASTAL MORPHOLOGY, *POTENTIAL SPILL IMPACTS
 0426 " MARINE ORGANISMS, HYDROCARBONS, BENTHOS, UPTAKE, SEDIMENTS, OCS, BASELINE STUDIES
 0427 " MARINE ORGANISMS, HYDROCARBONS, BENTHOS, UPTAKE, SEDIMENTS, OCS, BASELINE STUDIES
 0428 " MARINE ORGANISMS, HYDROCARBONS, BENTHOS, UPTAKE, SEDIMENTS, OCS, BASELINE STUDIES
 0429 " MICROORGANISMS, DEVELOPMENTS, ENVIRONMENTAL EFFECTS, OCS, BASELINE STUDIES
 0430 " BIOMASS, BENTHOS, BIOINDICATORS, SEDIMENTS, OCS, BASELINE STUDIES
 0434 " BEHAVIOR, FATE, MOVEMENT, PHYSICAL EFFECTS, SPREADING, ICE, BASELINE STUDIES, COLD
 CLIMATES
 0435 " ADSORPTION, HYDROCARBONS, OCS, PHYSICAL EFFECTS, FATE, *SUSPENDED MATTER
 0438 " BIODEGRADATION, MICROORGANISMS, SEDIMENTS, CRUDE OIL, OCS, BEAUFORT SEA, BASELINE
 STUDIES
 0440 " BIOLOGICAL EFFECTS, MARINE MAMMALS, BASELINE STUDIES, OCS, *SEA OTTER
 0441 " BASELINE STUDIES, ICE, OCS, BEHAVIOR, MOVEMENT, *OIL POOLING
 0442 " BASELINE STUDIES, SUBLETHAL EFFECTS, HYDROCARBONS, OCS, *TRACE METALS,
 *BIOTRANSFORMATIONS
 0447 " ACUTE EFFECTS, CHRONIC EFFECTS, TOXICITY, UPTAKE, DEPURATION, METABOLISM,
 ORGANISMS, HYDROCARBONS, BASELINE STUDIES
 0449 " FISHERIES, WILDLIFE, COASTS, OFFSHORE, DEVELOPMENT, BASELINE STUDIES, BEAUFORT SEA
 0450 " OCS, DEVELOPMENT, CONTAMINATION, ENVIRONMENTAL EFFECTS, BASELINE STUDIES
 0485 " ENVIRONMENTAL EFFECTS, OIL SPILLS, COASTAL WATERS, SHORELINES, BAYS,
 *VULNERABILITY INDEX
 0529 " BIODEGRADATION, CRUDE OIL, LAND FARMING, PLANTS, SOIL, FATE, CONTAMINATION
 0579 " FATE, NATURAL SEEPAGE, HYDROCARBONS
 0628 " ENVIRONMENTAL EFFECTS, OIL INDUSTRY, WILDLIFE, HABITATS
 0643 " OCS, DEVELOPMENT, OIL DISCHARGES, ESTUARIES, COASTS, OFFSHORE, OREGON, WASHINGTON,
 PACIFIC COAST
 0655 " US GOVERNMENT, OIL-GAS LEASING, COLD CLIMATES, ENVIRONMENTAL EFFECTS, SPILL
 RESPONSE
 0687 " STORAGE, ENVIRONMENTAL EFFECTS, PORTS, BALLAST, OIL TANKS, OIL-WATER SEPARATION

0745 ALASKA, OFFSHORE, OCS, DEVELOPMENT, SAFETY, RISK ANALYSIS, ATLANTIC COAST, PACIFIC
 COAST, US, *ENVIRONMENTAL HAZARDS
 0267 ALGAL, CRUDE OIL, FUEL OIL, BIOLOGICAL EFFECTS, TOXICITY, MICROORGANISMS, AROMATIC
 HYDROCARBONS, *DIATOMS
 0273 " FUEL OIL, CRUDE OIL, WASTE OIL, TOXICITY, BENTHOS, FRESHWATER, BACTERIA,
 METABOLISM, *COMMUNITIES
 0299 " CRUDE OIL, CONCENTRATIONS, METABOLISM, TOXICITY, BIOLOGICAL EFFECTS
 0355 " CRUDE OIL, METABOLISM, PLANKTON, LAKES, BIOMASS, ARCTIC
 0374 " WSP, HYDROCARBONS, CONCENTRATIONS, BIOASSAY, PHYTOPLANKTON
 0396 " TOXICITY, CONCENTRATIONS, REPRODUCTION
 0396 " CRUDE OIL, PETROLEUM PRODUCTS, MUTAGENS, TOXICITY, *CHLAMYDOMONAS REINHARDTII
 0490 " CONTAMINATION, BENTHOS, NORWAY, *OSLO FJORD
 0523 AMOCO CADIZ SPILL, CONCENTRATIONS, DETECTION, SPECTROMETRY, WSP, SEAWATER, *ENGLISH
 CHANNEL
 0038 " REMOTE SENSING, CONTAMINATION, COASTAL WATERS, FRANCE
 0061 " CHEMICAL ANALYSIS, CRUDE OIL, WSP, SEAWATER
 0085 " SAMPLING, SEAWATER, SEDIMENTS, ANALYTICAL TECHNIQUES, FRANCE, ENGLISH CHANNEL
 0086 " SAMPLING, CHEMICAL ANALYSIS, ZOOPLANKTON, AROMATIC HYDROCARBONS
 0089 " CONCENTRATIONS, HYDROCARBONS, SEAWATER, BAYS, COASTS, FRANCE
 0171 " SPILL CLEANUP, SPILL RESPONSE, EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING
 0207 " SPILL RESPONSE, HYDROCARBONS, CRUDE OIL, FRANCE, POLLUTION CONTROL
 0214 " CONTINGENCY PLANNING, TANKERS, OIL TANKS, STORAGE, OIL TRANSFER, OIL REMOVAL
 0215 " SPILL RESPONSE, CONTINGENCY PLANNING, FRANCE, *COMMISSION REPORT
 0229 " EUROPE, INTERNATIONAL AGREEMENTS, CONTINGENCY PLANNING, REGULATIONS
 0305 " BIOLOGICAL EFFECTS, SUBLETHAL EFFECTS, ZOOPLANKTON, *WESTON, *RESPIRATION,
 *PRIMARY PRODUCTION
 0312 " DISTRIBUTION, MORTALITY, SUBLETHAL EFFECTS, BENTHOS, MARINE ORGANISMS, FRANCE,
 COASTAL WATERS
 0318 " BIRDS, MORTALITY, ENGLISH CHANNEL, FRANCE
 0339 " TOXICITY, MARINE ORGANISMS, CRUDE OIL
 0352 " BIRDS, MORTALITY, UK, *AUKS
 0354 " CONTAMINATION, FISHERIES, MOLLUSKS, FISH, CRUSTACEANS, FRANCE
 0376 " BIOMASS, BIOLOGICAL EFFECTS, ZOOPLANKTON, COASTAL WATERS, FRANCE
 0404 " SEDIMENTATION, INTERTIDAL ZONE, BENTHOS, ENVIRONMENTAL EFFECTS, *SEALED PENETRATION
 0406 " DISTRIBUTION, PHYSICAL EFFECTS, SHORELINES, SEDIMENTATION, COASTS, INTERTIDAL
 ZONE, FRANCE
 0411 " FATE, SEDIMENTATION, SEDIMENTS, BEACHES, INTERTIDAL ZONE, SHORELINES, FRANCE
 0418 " BEHAVIOR, SEDIMENTATION, SEDIMENTS, WEATHERING, TOXICITY
 0419 " CONTAMINATION, SHORELINES, TOXICITY, WEATHERING
 0452 " REGULATIONS, INTERNATIONAL CONVENTIONS, EUROPE, *EEC
 0462 " CONTAMINATION, COASTS, ESTUARIES, FRANCE
 0474 " MARINE ORGANISMS, PLANTS, SEDIMENTS, COASTAL WATERS, SHORELINES
 0475 " ENVIRONMENTAL EFFECTS, SHORELINES, COASTS, FRANCE, STATISTICS
 0479 " FRANCE, COASTAL WATERS, ENVIRONMENTAL EFFECTS
 0483 " CHRONIC EFFECTS, ENVIRONMENTAL EFFECTS, BOOK REVIEW
 0491 " FATE, BEHAVIOR, MONITORING, SEDIMENTS, SEAWATER, BIODEGRADATION, MICROORGANISMS,
 TOXICITY, FISH, BIRDS
 0493 " ENVIRONMENTAL EFFECTS, MARINE ORGANISMS, COASTS, SAMPLING, ECOSYSTEMS, FRANCE,
 *SPECIAL ISSUE
 0496 " CHEMICAL ANALYSIS, BIODEGRADATION, OXIDATION, CHEMICAL EFFECTS, MARINE ORGANISMS
 0497 " SPILL RESPONSE, FRANCE, CONTINGENCY PLANNING, *ISTPM
 0501 " CHEMICAL ANALYSIS, GC/MS, OXIDATION
 0503 " ENVIRONMENTAL EFFECTS, COASTS, FRANCE
 0512 " ACUTE EFFECTS, ENVIRONMENTAL EFFECTS, BEHAVIOR, SEDIMENTATION, COASTS
 0623 " INTERNATIONAL AGREEMENTS, REGULATIONS, OFFSHORE, PRODUCTION, NORTH SEA, EKOFISK
 BLOWOUT
 0672 " ENVIRONMENTAL EFFECTS, TOXICITY, MARINE ORGANISMS, COASTS, SPILL CLEANUP, FRANCE
 0693 " TANKERS, FRANCE, *GROUNDINGS, *PHOTOGRAPHY
 0741 " FRANCE, COASTS, *DINOFLAGELLATE BLOOMS
 0748 " FRANCE, US, *RESEARCH REVIEW
 0021 ANALYTICAL TECHNIQUES, SEAWATER, HYDROCARBONS, *FLUORESCENCE SPECTROPHOTOMETRY
 0032 " AROMATIC HYDROCARBONS, CONCENTRATIONS, CHROMATOGRAPHY
 0034 " REMOTE SENSING, SOURCE IDENTIFICATION, OIL SLICKS, CANADA, *FLUORESCENCE
 0051 " CRUDE OIL, HYDROCARBONS, BENTHOS, INVERTEBRATES, CHRONIC EFFECTS, DEPURATION,
 CHROMATOGRAPHY, GC/MS
 0052 " FATE, HYDROCARBONS, CHEMICAL ANALYSIS, SAMPLING, DISTRIBUTION
 0053 " AROMATIC HYDROCARBONS, CHROMATOGRAPHY, SEAWATER, CONCENTRATIONS, CRUDE OIL
 0064 " BIOGENIC HYDROCARBONS, PETROLEUM PRODUCTS, MANUALS, *DISCRIMINATION
 0069 " HYDROCARBONS, BIRDS, CHROMATOGRAPHY, SPECTROSCOPY, *MALLARD DUCKS
 0085 " AMOCO CADIZ SPILL, SAMPLING, SEAWATER, SEDIMENTS, FRANCE, ENGLISH CHANNEL
 0096 " OIL INDUSTRY, PAH, CHROMATOGRAPHY
 0099 " CHEMICAL ANALYSIS, OIL INDUSTRY, BIODEGRADATION, MARINE ENVIRONMENT
 0109 " SAMPLING, DETECTION, AROMATIC HYDROCARBONS, BIOGENIC HYDROCARBONS, ZOOPLANKTON,
 ANIMALS
 0111 " PAH, MARINE ORGANISMS, SEDIMENTS, SEAWATER, DETECTION

0112 ANALYTICAL TECHNIQUES, PAH, SAMPLING, SOURCE IDENTIFICATION
 0116 " SOURCE IDENTIFICATION, CHEMICAL ANALYSIS, WEATHERING, SPECTROSCOPY, *CORRELATION
 COEFFICIENTS
 0118 " SOURCE IDENTIFICATION, OIL SPILLS, WEATHERING, USCG, *COMPUTERIZED PATTERN
 RECOGNITION
 0120 " SOURCE IDENTIFICATION, OIL SPILLS, MODELS, INFORMATION SYSTEMS, *PATTERN
 RECOGNITION
 0121 " SOURCE IDENTIFICATION, FUEL OIL, SPECTROMETRY
 0122 " SOURCE IDENTIFICATION, CHROMATOGRAPHY, SPECTROSCOPY
 0258 " CHRONIC EFFECTS, SUBLETHAL EFFECTS, BIRDS
 0288 " ACUTE EFFECTS, HYDROCARBONS, CHRONIC EFFECTS, TOXICITY, MORTALITY, BIRDS, WILDLIFE
 0390 " BIRDS, TOXICITY, HYDROCARBONS, GROWTH, DEVELOPMENT, UPTAKE, DEPOSITION, *RESEARCH
 REVIEW
 0470 " SOURCES, FATE, BIODEGRADATION, AQUATIC ENVIRONMENT, CONTAMINATION, BOOK REVIEW
 0556 " DETECTION, INFORMATION SYSTEMS, DESIGN-ENGINEERING
 0572 " PAH, AQUATIC ENVIRONMENT, HYDROCARBONS, CONCENTRATIONS, TOXICITY, FATE
 0024 ANIMALS, CHEMICAL ANALYSIS, PAH, DETECTION
 0109 " ANALYTICAL TECHNIQUES, SAMPLING, DETECTION, AROMATIC HYDROCARBONS, BIOGENIC
 HYDROCARBONS, ZOOPLANKTON
 0285 " UPTAKE, METABOLISM, DEPOSITION, AROMATIC HYDROCARBONS, *FATS
 0613 " OIL SHALE, PETROLEUM PRODUCTS, TOXICITY, HEALTH HAZARDS, CHRONIC EFFECTS, USSE,
 *PHENOLS, *ESTONIA
 0336 ANNELIDS, HYDROCARBONS, UPTAKE, METABOLISM, MARINE ORGANISMS, BIOINDICATORS,
 MOLLUSKS, CRUSTACEANS, *DETOXIFICATION MECHANISMS
 0346 " HYDROCARBONS, SEAWATER, SEDIMENTS, CONTAMINATION, UPTAKE, *RELEASE, *ARSENICOLA
 MARINA, *NAPHTHALENE
 0525 " BIODEGRADATION, PAH, COASTAL WATERS, SEDIMENTS, BENTHOS, MICROORGANISMS,
 *POLYCHAETE WORMS
 0107 AQUATIC ENVIRONMENT, SAMPLING, PAH, SOURCES, DISPERSION, SEDIMENTS, LAKES
 0316 " PAH, MARINE ORGANISMS, MOLLUSKS, UPTAKE, DEPOSITION, DISTRIBUTION
 0470 " ANALYTICAL TECHNIQUES, SOURCES, FATE, BIODEGRADATION, CONTAMINATION, BOOK REVIEW
 0572 " ANALYTICAL TECHNIQUES, PAH, HYDROCARBONS, CONCENTRATIONS, TOXICITY, FATE
 0020 ARCTIC, DETECTION, CONCENTRATIONS, HYDROCARBONS, SEAWATER, SEDIMENTS, CANADA, *BAFFIN
 BAY
 0030 " HYDROCARBONS, SEAWATER, CANADA, *HARLOT BASIN
 0045 " REMOTE SENSING, NATURAL SEEPAGE, DETECTION, COASTAL WATERS, CANADA
 0079 " BIODEGRADATION, BACTERIA, SEAWATER, FRESHWATER, ECOSYSTEMS, CONTAMINATION, CRUDE
 OIL, GASOLINE, STATISTICAL ANALYSIS
 0150 " DISPERSANTS, SPILL REMOVAL, BEAUFORT SEA, CANADA
 0179 " SPILL CLEANUP, SKINNEPS, DESIGN-ENGINEERING, PERFORMANCE TESTING, COLD CLIMATES,
 CANADA, *AMOP
 0184 " PERFORMANCE TESTING, BURNING, SPILL REMOVAL, ICE, *COMBUSTION PROMOTERS
 0195 " CONTINGENCY PLANNING, SPILL RESPONSE, BLOWOUTS, ICE, SPILL CONTAINMENT, BEAUFORT
 SEA
 0196 " CONTINGENCY PLANNING, SPILL RESPONSE, BLOWOUTS, OFFSHORE, DRILLING, CANADA
 0197 " CONTINGENCY PLANNING, SPILL CLEANUP, MANUALS, SPILL RESPONSE, BEAUFORT SEA,
 SHORELINES
 0201 " CONTINGENCY PLANNING, PREDICTIONS, BLOWOUTS, OFFSHORE, CANADA
 0210 " CONTINGENCY PLANNING, MARINE ENVIRONMENT, CANADA, BASELINE STUDIES, LABRADOR SEA,
 *INFORMATION ATLAS
 0219 " ICE, SPILL RESPONSE, SPILL CLEANUP, BEAUFORT SEA, ATLANTIC COAST, CANADA,
 *WORKSHOP OPINION SURVEY
 0251 " CONTINGENCY PLANNING, MARINE ENVIRONMENT, CANADA, BASELINE STUDIES, LABRADOR SEA,
 BOOK REVIEW
 0277 " CRUDE OIL, FUEL OIL, MORTALITY, CRUSTACEANS, *AMPHIPODS
 0295 " CRUDE OIL, BIOLOGICAL EFFECTS, PHYTOPLANKTON, ZOOPLANKTON, *TUNDRA PONDS
 0344 " BIOLOGICAL EFFECTS, METABOLISM, VEGETATION, SOIL, *TUNDRA, *ROOTS, *SOIL CELLULOSE
 0355 " ALGAE, CRUDE OIL, METABOLISM, PLANKTON, LAKES, BIOMASS
 0368 " CRUDE OIL, INVERTEBRATES, MARINE ORGANISMS, CANADA
 0369 " MARINE ORGANISMS, BIOLOGICAL EFFECTS, CRUDE OIL
 0378 " CRUDE OIL, BIOLOGICAL EFFECTS, SOIL, MICROORGANISMS, *DENITRIFICATION, *NITROGEN
 FIXATION
 0393 " MICROORGANISMS, CONTAMINATION, BIODEGRADATION, BIOINDICATORS, BARENTS SEA
 0413 " ICE, COLD CLIMATES, SEAWATER, *PERMEABILITY
 0431 " DISTRIBUTION, BACTERIA, BEAUFORT SEA, CANADA, BASELINE STUDIES
 0437 " BASELINE STUDIES, CANADA, MARINE ENVIRONMENT
 0463 " BIODEGRADATION, BIOLOGICAL EFFECTS, CRUDE OIL, MICROORGANISMS, CANADA, BEAUFORT
 SEA, BASELINE STUDIES
 0479 " OIL SPILLS, BURNING, BEAUFORT SEA, POLLUTION CONTROL, OIL REMOVAL
 0510 " PETROLEUM PRODUCTS, WEATHERING, BURNING, *CHEMICAL-PHYSICAL ASPECTS,
 *COMBUSTIBILITY, *RESIDUAL OILS
 0516 " BIODEGRADATION, CRUDE OIL, MICROORGANISMS, *TUNDRA PONDS, *PHOSPHATE FERTILIZERS
 ADDITION
 0517 " BIODEGRADATION, CRUDE OIL, PLANTS, MARINE ORGANISMS, CANADA
 0519 " BIODEGRADATION, CRUDE OIL, MICROORGANISMS, RIVERS, FRESHWATER, *MUTAGENIC ACTIVITY

0536 ARCTIC, BIODEGRADATION, MICROORGANISMS, SOIL, CRUDE OIL, FATE, BIOLOGICAL EFFECTS, *TUNDRA

0567 " COASTAL WATERS, ENVIRONMENTAL EFFECTS, SHORELINES, DISPERSANTS, *EXPERIMENTAL SPILLS

0592 " PHYSICAL ASPECTS, FATE, BEHAVIOR, OIL SPILLS, COLD CLIMATES, ICE, BEAUFORT SEA

0593 " BEHAVIOR, FATE, ICE, BURNING, EQUIPMENT, PERFORMANCE TESTING

0596 " OIL SPILLS, BUZZARDS BAY, *COMPARISON STUDY

0614 " CHEMICAL ANALYSIS, CHEMICAL EFFECTS, TOXICITY, DRILLING, OFFSHORE, EXPLOSION, WASTEWATER DISPOSAL, CANADA, *DRILLING MUDS

0078 ARGO MERCHANT SPILL, CHEMICAL ANALYSIS, CONCENTRATIONS, HYDROCARBONS, SEDIMENTS, CHROMATOGRAPHY, *UV FLUORESCENCE

0342 " BIRDS, OIL SPILLS, ATLANTIC COAST, CANADA, COLD CLIMATE, CHEMICAL ANALYSIS, CONTAMINATION, *GRANT WHITE SPILL

0576 " FATE, CONTAMINATION, HYDROCARBONS, SEDIMENTS, MODELS, TOXICITY

0671 " OIL SPILLS, TANKERS

0032 AROMATIC HYDROCARBONS, ANALYTICAL TECHNIQUES, CONCENTRATIONS, CHROMATOGRAPHY

0053 " ANALYTICAL TECHNIQUES, CHROMATOGRAPHY, SEAWATER, CONCENTRATIONS, CRUDE OIL

0072 " CHEMICAL ANALYSIS, CHROMATOGRAPHY, MOLLUSKS, *OYSTERS

0086 " ARGO CADIZ SPILL, SAMPLING, CHEMICAL ANALYSIS, ZOOPLANKTON

0087 " CHEMICAL ANALYSIS, CHROMATOGRAPHY, FISH, METABOLISM, *METABOLITES

0094 " CHEMICAL ANALYSIS, SEDIMENTS, GC/MS, DISTRIBUTION, SOURCES

0109 " ANIMALS, ANALYTICAL TECHNIQUES, SAMPLING, DETECTION, BIOGENIC HYDROCARBONS, ZOOPLANKTON

0263 " SUBLETHAL EFFECTS, MORTALITY, *TOLUENE, *RESPIRATION, *MARINE ISOPODS

0267 " ALGAE, CRUDE OIL, FUEL OIL, BIOLOGICAL EFFECTS, TOXICITY, MICROORGANISMS, *DIATOMS

0272 " TOXICITY, WSP, FUEL OIL, BEHAVIOR, SUBLETHAL EFFECTS, *BARNACLE LARVAE

0285 " ANIMALS, UPTAKE, METABOLISM, DEGRADATION, *PATS

0286 " FISH, UPTAKE, METABOLISM, CHEMICAL ANALYSIS, CHROMATOGRAPHY, *CORO SALMON, *NAPHTHALENE

0297 " TOXICITY, MARINE ORGANISMS, UPTAKE, METABOLISM, BIODEGRADATION

0300 " TOXICITY, GROWTH, BIRDS, *HALLARD DUCKS

0317 " CRUDE OIL, PHYTOPLANKTON, TOXICITY, METABOLISM

0328 " UPTAKE, METABOLISM, DEGRADATION, FISH, *PACIFIC HERRING, *BENTONITE, *TOLUENE

0337 " TOXICITY, FUEL OIL, MARINE ORGANISMS, *AMPHIPODS, *ELASMUS PECTINICIFUS

0341 " TOXICITY, FISH, UPTAKE, METABOLISM, *FUNDULUS HETEROCILITUS, *NAPHTHALENE, *SALINITY

0350 " CHEMICAL ANALYSIS, FISH, METABOLISM, CHROMATOGRAPHY, *METABOLITES

0362 " UPTAKE, DEGRADATION, CONCENTRATIONS, FISH, CRUDE OIL, *ORGANIC SULFUR COMPOUNDS

0366 " METABOLISM, INVERTEBRATES, FISH, MOLLUSKS, CRUSTACEANS

0383 " UPTAKE, METABOLISM, FISH, *PAINSCOTT TROUT, *PHEWANTHERINE

0407 " ADSORPTION, WASTEWATER TREATMENT, *ACTIVATED CARBON

0412 " ADSORPTION, ABSORPTION, CONTAMINATION, FRESHWATER, SEDIMENTS, RIVERS, LAKES

0500 " BIOLOGICAL EFFECTS, CRUSTACEANS, *CRAYFISH, *PHYSIOLOGICAL EFFECTS, *NAPHTHALENE

0533 " BIODEGRADATION, MICROORGANISMS, HYDROCARBONS, METABOLISM

0591 " METABOLISM, MARINE ORGANISMS, FATE, UPTAKE

0599 " BIOASSAY, OIL SHALE, CRUDE OIL, FOSSIL FUELS, CARCINOGENS, HEALTH HAZARDS, *PNA

0701 " WASTEWATER TREATMENT, PETROCHEMICALS, CONTAMINATION, *STYRENE MONOMER FACILITY

0056 ATLANTIC COAST, CHEMICAL ANALYSIS, SAMPLING, PAH, OCS, SEDIMENTS, HYDROCARBONS

0219 " ARCTIC, ICE, SPILL RESPONSE, SPILL CLEANUP, BEAUFORT SEA, CANADA, *WORKSHOP OPINION SURVEY

0342 " ARGO MERCHANT SPILL, BIRDS, OIL SPILLS, CANADA, COLD CLIMATE, CHEMICAL ANALYSIS, CONTAMINATION, *GRANT WHITE SPILL

0401 " BIOLOGICAL EFFECTS, MOLLUSKS, MAINE, *OIL SPILL SITES, *NYA APENAPIA, *NEOPLASMS

0436 " BIRDS, BEACHES, CONTAMINATION, BASELINE STUDIES, OFFSHORE, EXPLOSION

0511 " ENVIRONMENTAL EFFECTS, OIL SPILLS, DELAWARE, *SEA GRANT RESEARCH

0568 " PREDICTIONS, SEDIMENTS, OIL SPILLS, RISK ANALYSIS, OCS, SANTA BARBARA CHANNEL

0619 " ECONOMIC EFFECTS, OFFSHORE, EXPLOSION, PRODUCTION, GULF OF MEXICO, WATER QUALITY

0621 " LEGISLATION, OIL-GAS LEASING, OFFSHORE

0624 " FISHERIES, RESOURCE MANAGEMENT, OCS, DEVELOPMENT, GEORGE BANK, DRILLING, HABITATS

0659 " OCS, DEVELOPMENT, FISHERIES, RISK ANALYSIS

0745 " ALASKA, OFFSHORE, OCS, DEVELOPMENT, SAFETY, RISK ANALYSIS, PACIFIC COAST, US, *ENVIRONMENTAL HAZARDS

0057 ATLANTIC OCEAN, CHEMICAL ANALYSIS, HYDROCARBONS, SEAWATER, GEORGE BANK

0098 " HYDROCARBONS, BIODEGRADATION, BACTERIA, MARINE ENVIRONMENT, SEDIMENTS, SEAWATER, *SCREENING

0504 " NATURAL SEEPAGE, CRUDE OIL, NOAA

0543 " HYDROCARBONS, PETROLEUM PRODUCTS, FATE, SEDIMENTS, MOVEMENT, *NEW YORK BIGHT

0075 BACTERIA, DISTRIBUTION, HYDROCARBONS, BIODEGRADATION, PACIFIC OCEAN, *SOUTH CHINA SEA

0079 " ARCTIC, BIODEGRADATION, SEAWATER, FRESHWATER, ECOSYSTEMS, CONTAMINATION, CRUDE OIL, GASOLINE, STATISTICAL ANALYSIS

0099 " ATLANTIC OCEAN, HYDROCARBONS, BIODEGRADATION, MARINE ENVIRONMENT, SEDIMENTS, SEAWATER, *SCREENING

0260 " ACUTE EFFECTS, CRUDE OIL, BENTHOS, GROWTH, CHRONIC EFFECTS, OCS, TEXAS

0273 " ALGAE, FUEL OIL, CRUDE OIL, WASTE OIL, TOXICITY, BENTHOS, FRESHWATER, METABOLISM, *COMMUNITIES

0296 " BIODEGRADATION, SEAWATER, CONTAMINATION, STATISTICAL ANALYSIS, JAPAN

0294 BACTERIA, MICROORGANISMS, SEAWATER, CONTAMINATION, *SURVIVAL
0300 " CRUDE OIL, FISH, BIOLOGICAL EFFECTS, *MULLET, *FIN EROSION, *BACTERIOLOGICAL ASPECTS
0307 " CRUDE OIL, PETROLEUM PRODUCTS, UPTAKE, TOXICITY, MICROORGANISMS
0321 " CRUDE OIL, BIOLOGICAL EFFECTS, *CLOSED SYSTEMS, *BACTERIAL SUCCESSIONS
0351 " BIOLOGICAL EFFECTS, DISPERSANTS, MICROORGANISMS, STATISTICAL ANALYSIS, PRODUCT INFORMATION
0354 " BIODEGRADATION, HYDROCARBONS, SEAWATER, SEDIMENTS, STATISTICAL ANALYSIS, JAPAN
0395 " ALASKA, CRUDE OIL, BIOLOGICAL EFFECTS, FUNGI, SOIL, *HOT OIL, *TAIGA SOIL
0431 " ARCTIC, DISTRIBUTION, BEAUFORT SEA, CANADA, BASELINE STUDIES
0523 " BIODEGRADATION, OFFSHORE, OIL FIELDS, GULF OF MEXICO, *BACTERIOLOGICAL ASPECTS
0524 " BIODEGRADATION, FRESHWATER, COASTS, ESTUARIES, NORTH CAROLINA
0526 " BIODEGRADATION, CRUDE OIL, TAR SANDS, SEAWATER, HYDROCARBONS, EQUIPMENT, PHYSICAL EFFECTS, *TEMPERATURE
0527 " BIODEGRADATION, SOIL, ONSHORE, PETROLEUM PRODUCTS, *ROADSIDE ENVIRONMENTS, *HIGHWAY RUNOFF
0530 " BIODEGRADATION, CRUDE OIL, HYDROCARBONS, SOIL, CHEMICAL ANALYSIS
0531 " BIODEGRADATION, EKOFISK BLOWOUT, NORTH SEA, FUNGI
0535 " BIODEGRADATION, MICROORGANISMS, FUNGI, HYDROCARBONS
0538 " BIODEGRADATION, CRUDE OIL, CHEMICAL ANALYSIS, *CALM ISOTOPES
0540 " BIODEGRADATION, OIL REMOVAL, HYDROCARBONS, MICROORGANISMS, *ENHANCED OIL RECOVERY
0746 " BIODEGRADATION, GULF OF MEXICO, *IRON REQUIREMENTS
0750 " UPTAKE, HYDROCARBONS, METABOLISM, *CROSOTE-TREATED PILING, *ISPODS, *LIMNORIA TRIPUNCTATA
0239 BALLAST, SPILL RESPONSE, POLLUTION CONTROL, OIL DISCHARGES, TANKERS, BIRDS, SPILL COOPERATIVES, OIL INDUSTRY
0401 " OIL TERMINALS, POLLUTION PREVENTION, REGULATIONS, TANKERS, OIL TRANSFER, UK, *SULLION VCE
0405 " OIL DISCHARGES, TANKERS, POLLUTION CONTROL, SEGREGATED BALLAST, PORTS, *LOAD ON TOP METHOD
0407 " ALASKA, STORAGE, ENVIRONMENTAL EFFECTS, PORTS, OIL TANKS, OIL-WATER SEPARATION
0237 BALTIC SEA, POLLUTION CONTROL, INTERNATIONAL CONVENTIONS, *ENVIRONMENTAL PROTECTION
0343 " ACUTE EFFECTS, MARINE ORGANISMS, FUEL OIL, COASTAL WATERS, *TSEBIS SPILL
0393 BARENTS SEA, ARCTIC, MICROORGANISMS, CONTAMINATION, BIODEGRADATION, BIOINDICATORS
0210 BASELINE STUDIES, ARCTIC, CONTINGENCY PLANNING, MARINE ENVIRONMENT, CANADA, LABRADOR SEA, *INFORMATION ATLAS
0251 " ARCTIC, CONTINGENCY PLANNING, MARINE ENVIRONMENT, CANADA, LABRADOR SEA, BOOK REVIEW
0426 " ALASKA, MARINE ORGANISMS, HYDROCARBONS, BENTHOS, UPTAKE, SEDIMENTS, OCS
0427 " ALASKA, MARINE ORGANISMS, HYDROCARBONS, BENTHOS, UPTAKE, SEDIMENTS, OCS
0428 " ALASKA, MARINE ORGANISMS, HYDROCARBONS, BENTHOS, UPTAKE, SEDIMENTS, OCS
0429 " ALASKA, MICROORGANISMS, DEVELOPMENTS, ENVIRONMENTAL EFFECTS, OCS
0430 " ALASKA, BIOMASS, BENTHOS, BIOINDICATORS, SEDIMENTS, OCS
0431 " BACTERIA, ARCTIC, DISTRIBUTION, BEAUFORT SEA, CANADA
0432 " ALABAMA, MISSISSIPPI, FLORIDA, OCS, *MAFLA SURVEY
0433 " ALABAMA, MISSISSIPPI, FLORIDA, OCS, *MAFLA SURVEY
0434 " ALASKA, BEHAVIOR, FATE, MOVEMENT, PHYSICAL EFFECTS, SPREADING, ICE, COLD CLIMATES
0436 " ATLANTIC COAST, BIRDS, BEACHES, CONTAMINATION, OFFSHORE, EXPLORATION
0437 " ARCTIC, CANADA, MARINE ENVIRONMENT
0438 " ALASKA, BIODEGRADATION, MICROORGANISMS, SEDIMENTS, CRUDE OIL, OCS, BEAUFORT SEA
0439 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, PACIFIC COAST, ECOSYSTEMS, PREDICTIONS
0440 " ALASKA, BIOLOGICAL EFFECTS, MARINE MAMMALS, OCS, *SEA OTTER
0441 " ALASKA, ICE, OCS, BEHAVIOR, MOVEMENT, *OIL POOLING
0442 " ALASKA, SUBLETHAL EFFECTS, HYDROCARBONS, OCS, *TRACE METALS, *BIOTRANSFORMATIONS
0443 " ENVIRONMENTAL EFFECTS, SPILL RESPONSE, MOVEMENT, PREDICTIONS, OCS, DRILLING, LABRADOR SEA, CANADA, *TRAJECTORIES, *NEWFOUNDLAND
0444 " ENVIRONMENTAL EFFECTS, OCS, DRILLING, BLOWOUTS, CANADA, LABRADOR SEA, *NEWFOUNDLAND
0445 " ENVIRONMENTAL EFFECTS, BLOWOUTS, OCS, LABRADOR SEA, CANADA, *BIOLOGICAL DESCRIPTIONS
0446 " BIOLOGICAL EFFECTS, FISHERIES, RESOURCE MANAGEMENT, BIRDS, MARINE MAMMALS, FISH, LABRADOR SEA
0447 " ALASKA, ACUTE EFFECTS, CHRONIC EFFECTS, TOXICITY, UPTAKE, DEPOSITION, METABOLISM, ORGANISMS, HYDROCARBONS
0448 " MONITORING, ENVIRONMENTAL EFFECTS, OIL SHALE, DEVELOPMENT, *COLORADO
0449 " ALASKA, FISHERIES, WILDLIFE, COASTS, OFFSHORE, DEVELOPMENT, BEAUFORT SEA
0450 " ALASKA, OCS, DEVELOPMENT, CONTAMINATION, ENVIRONMENTAL EFFECTS
0463 " ARCTIC, BIODEGRADATION, BIOLOGICAL EFFECTS, CRUDE OIL, MICROORGANISMS, CANADA, BEAUFORT SEA
0559 " SIMULATIONS, BLOWOUTS, LABRADOR SEA, CANADA, SPILL RESPONSE, CONTINGENCY PLANNING
0639 " ENVIRONMENTAL EFFECTS, OIL SHALE, DEVELOPMENT, PRODUCTION, MONITORING, *PROCEEDINGS
0089 BAYS, ASOCO CADIZ SPILL, CONCENTRATIONS, HYDROCARBONS, SEAWATER, COASTS, FRANCE
0194 " SHIPS, OIL SPILLS, SPILL CLEANUP, NEW YORK, HARBORS
0485 " ALASKA, ENVIRONMENTAL EFFECTS, OIL SPILLS, COASTAL WATERS, SHORFLINPS, *VULNERABILITY INDEX
0551 " FATE, FISH, CHEMICAL EFFECTS, CONCENTRATIONS, SOURCES, SEDIMENTS, WASHINGTON, ZOOPLANKTON, *FEEDAL PELLETS

0656 BAYS, REFINERIES, DOT, USCG, SPILL RESPONSE, VIRGINIA
 0140 BEACH CLEANUP, SPILL CLEANUP, EQUIPMENT, BOOMS, SKIMMERS
 0147 " SEDIMENTS, EQUIPMENT, PATENT, *CRYOGENIC METHOD
 0157 " DISPERSANTS, BIOLOGICAL EFFECTS, TOXICITY, BIOASSAY, INTERTIDAL ZONE, PERFORMANCE TESTING
 0165 " ADSORBENTS, SOIL, CRUDE OIL, BURNING, *RESIDUAL OILS, *SINKING
 0186 " SPILL DISPOSAL, TAR, INCINERATION, EQUIPMENT, DESIGN-ENGINEERING
 0059 BEACHES, SAMPLING, CONCENTRATIONS, SEDIMENTS, COASTS
 0188 " SHOEBELINES, CONTAMINATION, SEDIMENTS, RESTORATION
 0405 " TAR, INDIA, COASTS, *RESIDUAL OILS
 0408 " ADSORPTION, DISPERSANTS, SEDIMENTS, CRUDE OIL, CONTAMINATION
 0411 " AMOCO CADIZ SPILL, FATE, SEDIMENTATION, SEDIMENTS, INTERTIDAL ZONE, SHOEBELINES, FRANCE
 0404 " PHYSICAL EFFECTS, INTERTIDAL ZONE, WEATHERING, DISPERSION, *MECHANICAL DISPERSAL
 0415 " INTERTIDAL ZONE, CRUDE OIL, DISTRIBUTION, SEDIMENTATION, SPAIN, *EQUIOLA SPILL
 0436 " BASELINE STUDIES, ATLANTIC COAST, BIRDS, CONTAMINATION, OFFSHORE, EXPLORATION
 0420 " CRUDE OIL, MARINE ENVIRONMENT, BIOLOGICAL EFFECTS, FATE, BEHAVIOR, COASTS, BIRDS, FISH, MARINE ORGANISMS, HEALTH HAZARDS
 0660 " BURNING, OIL SPILLS, TEXAS, COASTAL WATERS, *BURNAR AGATE SPILL
 0081 BEAUFORT SEA, CHEMICAL ANALYSIS, SEDIMENTS, GULF OF ALASKA, BERING SEA
 0150 " ARCTIC, DISPERSANTS, SPILL REMOVAL, CANADA
 0195 " ARCTIC, CONTINGENCY PLANNING, SPILL RESPONSE, BLOWOUTS, ICE, SPILL CONTAINMENT
 0197 " ARCTIC, CONTINGENCY PLANNING, SPILL CLEANUP, MANUALS, SPILL RESPONSE, SHOEBELINES
 0219 " ATLANTIC COAST, ARCTIC, ICE, SPILL RESPONSE, SPILL CLEANUP, CANADA, *WORKSHOP OPINION SURVEY
 0431 " BASELINE STUDIES, BACTERIA, ARCTIC, DISTRIBUTION, CANADA
 0438 " BASELINE STUDIES, ALASKA, BIODEGRADATION, MICROORGANISMS, SEDIMENTS, CRUDE OIL, OCS
 0449 " BASELINE STUDIES, ALASKA, FISHERIES, WILDLIFE, COASTS, OFFSHORE, DEVELOPMENT
 0463 " BASELINE STUDIES, ARCTIC, BIODEGRADATION, BIOLOGICAL EFFECTS, CRUDE OIL, MICROORGANISMS, CANADA
 0479 " ARCTIC, OIL SPILLS, BURNING, POLLUTION CONTROL, OIL REMOVAL
 0592 " ARCTIC, PHYSICAL ASPECTS, FATE, BEHAVIOR, OIL SPILLS, COLD CLIMATES, ICE
 0192 BEHAVIOR, PERSONNEL TRAINING, CONTINGENCY PLANNING, SPILL RESPONSE, COASTS, OIL SPILLS, CANADA, *WORKSHOPS
 0200 " SPILL RESPONSE, EQUIPMENT, USCG, STATISTICAL ANALYSIS, INFORMATION SYSTEMS, TANKERS, OIL SLICKS
 0272 " AROMATIC HYDROCARBONS, TOXICITY, WSP, FUEL OIL, SUBLETHAL EFFECTS, *BARFACLE LARVAE
 0293 " FISH, INVERTEBRATES, MARINE ORGANISMS, MONITORING, BIOINDICATORS, COASTAL WATERS
 0392 " CRUSTACEANS, FUEL OIL, TOXICITY, *LINGULUS POLYPHEMUS, *MOLTING
 0410 " EKOFISK BLOWOUT, NORTH SEA, OIL SLICKS, FATE, DISTRIBUTION
 0417 " PHYSICAL ASPECTS, BLOWOUTS, SEAWATER, SEA SURFACE, MOVEMENT, FATE
 0418 " AMOCO CADIZ SPILL, SEDIMENTATION, SEDIMENTS, WEATHERING, TOXICITY
 0434 " BASELINE STUDIES, ALASKA, FATE, MOVEMENT, PHYSICAL EFFECTS, SPREADING, ICE, COLD CLIMATES
 0441 " BASELINE STUDIES, ALASKA, ICE, OCS, MOVEMENT, *OIL POOLING
 0480 " BEACHES, CRUDE OIL, MARINE ENVIRONMENT, BIOLOGICAL EFFECTS, FATE, COASTS, BIRDS, FISH, MARINE ORGANISMS, HEALTH HAZARDS
 0486 " HYDROCARBONS, FATE, POLLUTION CONTROL, COST ANALYSIS, ENVIRONMENTAL EFFECTS
 0491 " AMOCO CADIZ SPILL, FATE, MONITORING, SEDIMENTS, SEAWATER, BIODEGRADATION, MICROORGANISMS, TOXICITY, FISH, BIRDS
 0492 " EKOFISK BLOWOUT, NORTH SEA, ENVIRONMENTAL EFFECTS, FATE, *RESEARCH REVIEW
 0498 " HYDROCARBONS, FATE, POLLUTION CONTROL, COST ANALYSIS, ENVIRONMENTAL EFFECTS, BOOM REVIEW
 0508 " SPILL CLEANUP, IXTOC 1 BLOWOUT, TEXAS, COASTAL WATERS, OIL SLICKS, ENVIRONMENTAL EFFECTS
 0512 " AMOCO CADIZ SPILL, ACUTE EFFECTS, ENVIRONMENTAL EFFECTS, SEDIMENTATION, COASTS
 0513 " OIL SPILLS, STATISTICS, ENVIRONMENTAL EFFECTS, SPILL CLEANUP, TANKERS, SHIPS, BIODEGRADATION, SPILL CONTAINMENT, *GENERAL REVIEW
 0545 " OIL SLICKS, SEA SURFACE, PHYSICAL ASPECTS, *SUNLIGHT GLITTER
 0547 " DRIFT, MOVEMENT, PHYSICAL ASPECTS, OIL SLICKS, *WAVE AND WIND ACTION
 0548 " DRIFT, OIL SLICKS, PHYSICAL EFFECTS
 0549 " OIL SLICKS, SPREADING, DRIFT, SEA SURFACE
 0550 " EKOFISK BLOWOUT, NORTH SEA, DRIFT, PHYSICAL ASPECTS
 0552 " PHYSICAL EFFECTS, MOVEMENT, OIL SLICKS
 0553 " CRUDE OIL, ICE, MOVEMENT, OIL SLICKS, *CURRENTS, *OIL-UNDER-ICE
 0558 " MOVEMENT, DRIFT, OIL SLICKS, GULF OF MEXICO, IXTOC 1 BLOWOUT, ENVIRONMENTAL EFFECTS
 0561 " PHYSICAL ASPECTS, DISPERSION, DISPERSANTS
 0562 " FATE, ICE, SIMULATIONS, OIL INDUSTRY, *PACK ICE, *APOA
 0563 " PREDICTIONS, DRIFT, OIL SPILLS
 0569 " SIMULATIONS, SPILL TRAJECTORIES
 0574 " OIL SPILLS, OCS, NORWAY, FATE
 0577 " FATE, OFFSHORE
 0580 " FATE, CRUDE OIL, OIL DISCHARGES, OFFSHORE, PRODUCTION, OIL FIELDS, NORTH SEA
 0581 " FATE, CRUDE OIL, OIL DISCHARGES, BLOWOUTS, EKOFISK BLOWOUT, NORTH SEA, OFFSHORE

0582 BEHAVIOR, FATE, PHYSICAL ASPECTS, REMOTE SENSING
 0586 " EKOFISK BLOWOUT, NORTH SEA, FATE, OIL SLICKS, MOVEMENT
 0588 " PHYSICAL ASPECTS, WEATHERING, CHEMICAL EFFECTS, BIODEGRADATION, FATE, PETROLEUM
 PRODUCTS, MARINE ENVIRONMENT
 0592 " BEAUFORT SEA, ARCTIC, PHYSICAL ASPECTS, FATE, OIL SPILLS, COLD CLIMATES, ICE
 0593 " ARCTIC, FATE, ICE, BURNING, EQUIPMENT, PERFORMANCE TESTING
 0051 BENTHOS, ANALYTICAL TECHNIQUES, CRUDE OIL, HYDROCARBONS, INVERTEBRATES, CHRONIC
 EFFECTS, DEPURATION, CHROMATOGRAPHY, GC/MS
 0260 " BACTERIA, ACUTE EFFECTS, CRUDE OIL, GROWTH, CHRONIC EFFECTS, OCS, TEXAS
 0273 " BACTERIA, ALGAE, FUEL OIL, CRUDE OIL, WASTE OIL, TOXICITY, FRESHWATER, METABOLISM,
 *COMMUNITIES
 0302 " ECOSYSTEMS, CHRONIC EFFECTS, FUEL OIL, *NEPL EXPERIMENTS
 0312 " AMOCO CADIZ SPILL, DISTRIBUTION, MORTALITY, SUBLETHAL EFFECTS, MARINE ORGANISMS,
 FRANCE, COASTAL WATERS
 0367 " INDUSTRIES, WASTEWATERS, CONTAMINATION, MARINE ENVIRONMENT
 0386 " NATURAL SEEPAGE, BIOLOGICAL EFFECTS, DISTRIBUTION, MARINE ORGANISMS,
 MICROORGANISMS, SANTA BARBARA CHANNEL
 0404 " AMOCO CADIZ SPILL, SEDIMENTATION, INTERTIDAL ZONE, ENVIRONMENTAL EFFECTS, *STABD
 PENETRATION
 0426 " BASELINE STUDIES, ALASKA, MARINE ORGANISMS, HYDROCARBONS, UPTAKE, SEDIMENTS, OCS
 0427 " BASELINE STUDIES, ALASKA, MARINE ORGANISMS, HYDROCARBONS, UPTAKE, SEDIMENTS, OCS
 0428 " BASELINE STUDIES, ALASKA, MARINE ORGANISMS, HYDROCARBONS, UPTAKE, SEDIMENTS, OCS
 0430 " BASELINE STUDIES, ALASKA, BIOMASS, BIOINDICATORS, SEDIMENTS, OCS
 0464 " WASTEWATERS, OIL FIELDS, SEDIMENTS, MARINE ORGANISMS, HYDROCARBONS,
 CONCENTRATIONS, TEXAS, *BRINES
 0490 " ALGAE, CONTAMINATION, NORWAY, *OSLO FJORD
 0525 " ANNELIDS, BIODEGRADATION, PAH, COASTAL WATERS, SEDIMENTS, MICROORGANISMS,
 *POLYCHAETE WORMS
 0612 " BIOLOGICAL EFFECTS, TOXICITY, OFFSHORE, DRILLING, ESTUARIES, MARINE ORGANISMS,
 *BIOCIDES
 0081 BERING SEA, BEAUFORT SEA, CHEMICAL ANALYSIS, SEDIMENTS, GULF OF ALASKA
 0092 " CHEMICAL ANALYSIS, CHROMATOGRAPHY, SEDIMENTS, GULF OF ALASKA
 0261 " CRUDE OIL, PHYTOPLANKTON, TOXICITY
 0044 BIBLIOGRAPHIES, REMOTE SENSING, DETECTION, MONITORING, POLLUTION CONTROL, ESTUARIES
 0152 " SPILL CLEANUP, SPILL DISPOSAL, GUIDELINES, MODELS
 0232 " SPILL CLEANUP, POLLUTION PREVENTION, POLLUTION CONTROL, EQUIPMENT, BLOWOUT
 PREVENTION
 0274 " BIRDS, BOOK REVIEW, PHYSICAL EFFECTS, *USFWS
 0499 " MARINE ENVIRONMENT, ESTUARIES, ENVIRONMENTAL EFFECTS
 0739 " MEDITERRANEAN SEA, MONITORING, CONTAMINATION
 0004 BIOASSAY, MONITORING, BIOINDICATORS, CONTAMINATION, METABOLISM
 0029 " DETECTION, SAMPLING, CHEMICAL ANALYSIS, BIOINDICATORS, WATER QUALITY
 0157 " BEACH CLEANUP, DISPERSANTS, BIOLOGICAL EFFECTS, TOXICITY, INTERTIDAL ZONE,
 PERFORMANCE TESTING
 0262 " MOLLUSKS, UPTAKE, HYDROCARBONS, *CHRONIC POLLUTION, *MUSSELS
 0265 " CHRONIC EFFECTS, CONTAMINATION, MOLLUSKS, CRUDE OIL, ESTUARIES, SEDIMENTS, *OYSTERS
 0374 " ALGAE, WSP, HYDROCARBONS, CONCENTRATIONS, PHYTOPLANKTON
 0380 " TOXICITY, VERTEBRATES, CHRONIC EFFECTS, *AMPHIBIANS
 0599 " AROMATIC HYDROCARBONS, OIL SHALE, CRUDE OIL, FOSSIL FUELS, CARCINOGENS, HEALTH
 HAZARDS, *PNA
 0075 BIODEGRADATION, BACTERIA, DISTRIBUTION, HYDROCARBONS, PACIFIC OCEAN, *SOUTH CHINA SEA
 0079 " BACTERIA, ARCTIC, SEAWATER, FRESHWATER, ECOSYSTEMS, CONTAMINATION, CRUDE OIL,
 GASOLINE, STATISTICAL ANALYSIS
 0098 " BACTERIA, ATLANTIC OCEAN, HYDROCARBONS, MARINE ENVIRONMENT, SEDIMENTS, SEAWATER,
 *SCREENING
 0099 " ANALYTICAL TECHNIQUES, CHEMICAL ANALYSIS, OIL INDUSTRY, MARINE ENVIRONMENT
 0101 " CHEMICAL ANALYSIS, CHROMATOGRAPHY, HYDROCARBONS, *ALKANES
 0172 " SPILL REMOVAL, DISPERSANTS, MICROORGANISMS, PATENT
 0296 " BACTERIA, SEAWATER, CONTAMINATION, STATISTICAL ANALYSIS, JAPAN
 0297 " AROMATIC HYDROCARBONS, TOXICITY, MARINE ORGANISMS, UPTAKE, METABOLISM
 0358 " BACTERIA, HYDROCARBONS, SEAWATER, SEDIMENTS, STATISTICAL ANALYSIS, JAPAN
 0393 " BARENTS SEA, ARCTIC, MICROORGANISMS, CONTAMINATION, BIOINDICATORS
 0438 " BEAUFORT SEA, BASELINE STUDIES, ALASKA, MICROORGANISMS, SEDIMENTS, CRUDE OIL, OCS
 0463 " BEAUFORT SEA, BASELINE STUDIES, ARCTIC, BIOLOGICAL EFFECTS, CRUDE OIL,
 MICROORGANISMS, CANADA
 0470 " AQUATIC ENVIRONMENT, ANALYTICAL TECHNIQUES, SOURCES, FATE, CONTAMINATION, BOOK
 REVIEW
 0491 " BEHAVIOR, AMOCO CADIZ SPILL, FATE, MONITORING, SEDIMENTS, SEAWATER,
 MICROORGANISMS, TOXICITY, FISH, BIRDS
 0496 " AMOCO CADIZ SPILL, CHEMICAL ANALYSIS, OXIDATION, CHEMICAL EFFECTS, MARINE ORGANISMS
 0513 " BEHAVIOR, OIL SPILLS, STATISTICS, ENVIRONMENTAL EFFECTS, SPILL CLEANUP, TANKERS,
 SHIPS, SPILL CONTAINMENT, *GENERAL REVIEW
 0515 " PHYSICAL ASPECTS, CHEMICAL EFFECTS, OXIDATION, SPILL CLEANUP, MICROORGANISMS, LAND
 FARMING, *STIMULATION
 0516 " ARCTIC, CRUDE OIL, MICROORGANISMS, *TUNDRA PONDS, *PHOSPHATE FERTILIZER ADDITION

0517 BIODEGRADATION, ARCTIC, CRUDE OIL, PLANTS, MARINE ORGANISMS, CANADA
 0518 " ENVIRONMENTAL EFFECTS, MICROORGANISMS, POLLUTION CONTROL, SPILL RESPONSE, *CONTAINED SPILLS
 0519 " ARCTIC, CRUDE OIL, MICROORGANISMS, RIVERS, FRESHWATER, *MUTAGENIC ACTIVITY
 0520 " SLUDGE, SOIL, DISPOSAL, STORAGE, REFINERIES, LAND FARMING
 0521 " SLUDGE, LAND FARMING, SOIL, GROUNDWATER, *LEACHATES
 0522 " MICROORGANISMS, *PSEUDOMONAS CITRONELLOIS, *RECASCITANT BRANCHED HYDROCARBONS
 0523 " BACTERIA, OFFSHORE, OIL FIELDS, GULF OF MEXICO, *BACTERIOLOGICAL ASPECTS
 0524 " BACTERIA, FRESHWATER, COASTS, ESTUARIES, NORTH CAROLINA
 0525 " BENTHOS, ANNELIDS, PAH, COASTAL WATERS, SEDIMENTS, MICROORGANISMS, *POLYCHAETE WORMS
 0526 " BACTERIA, CRUDE OIL, TAR SANDS, SEAWATER, HYDROCARBONS, EQUIPMENT, PHYSICAL EFFECTS, *TEMPERATURE
 0527 " BACTERIA, SOIL, ONSHORE, PETROLEUM PRODUCTS, *ROADSIDE ENVIRONMENTS, *HIGHWAY RUNOFF
 0528 " OIL SLICKS, PRODUCT INFORMATION
 0529 " ALASKA, CRUDE OIL, LAND FARMING, PLANTS, SOIL, PATE, CONTAMINATION
 0530 " BACTERIA, CRUDE OIL, HYDROCARBONS, SOIL, CHEMICAL ANALYSIS
 0531 " BACTERIA, EKOFISK BLOWOUT, NORTH SEA, FUNGI
 0532 " METABOLISM, FISH, BIOINDICATORS, MONITORING
 0533 " AROMATIC HYDROCARBONS, MICROORGANISMS, HYDROCARBONS, METABOLISM
 0534 " HYDROCARBONS, METABOLISM, OXIDATION, *ALKANES
 0535 " BACTERIA, MICROORGANISMS, FUNGI, HYDROCARBONS
 0536 " ARCTIC, MICROORGANISMS, SOIL, CRUDE OIL, PATE, BIOLOGICAL EFFECTS, *TUNDRA
 0537 " SAMPLING, MICROORGANISMS, PAH, FRESHWATER, *PHENANTHRENE
 0538 " BACTERIA, CRUDE OIL, CHEMICAL ANALYSIS, *CALI ISOTOPES
 0539 " MICROORGANISMS, ENVIRONMENTAL EFFECTS
 0540 " BACTERIA, OIL REMOVAL, HYDROCARBONS, MICROORGANISMS, *ENHANCED OIL RECOVERY
 0541 " PAH, ESTUARIES, COASTAL WATERS, UPTAKE, METABOLISM, OXIDATION
 0542 " BEHAVIOR, PHYSICAL ASPECTS, WEATHERING, CHEMICAL EFFECTS, PATE, PETROLEUM PRODUCTS, MARINE ENVIRONMENT
 0543 " OIL SPILLS, SEA SURFACE, DISPERSION, WEATHERING, PATE, SEDIMENTATION, MICROORGANISMS
 0544 " CRUDE OIL, CHEMICAL ANALYSIS, WEATHERING, *COMPOSITION
 0545 " WASTEWATER TREATMENT, REFINERIES, OIL-WATER SEPARATION, SLUDGE, FLOCCULATION, CONTAMINATION
 0546 " WASTEWATERS, DISPOSAL, WASTE OIL, LAND FARMING, RECLAMATION, FUEL OIL
 0547 " BACTERIA, GULF OF MEXICO, *IRON REQUIREMENTS
 0548 " BIOGENIC HYDROCARBONS, HYDROCARBONS, CONCENTRATIONS, CHEMICAL ANALYSIS, CHROMATOGRAPHY
 0549 " ANALYTICAL TECHNIQUES, PETROLEUM PRODUCTS, SAMPLES, *DISCRIMINATION
 0550 " AROMATIC HYDROCARBONS, ANALYSIS, ANALYTICAL TECHNIQUES, SAMPLING, DETECTION, ZOOPLANKTON
 0551 " SOURCE IDENTIFICATION, DETECTION, HYDROCARBONS, MARINE ORGANISMS
 0552 " BIOINDICATORS, BIOASSAY, MONITORING, CONTAMINATION, METABOLISM
 0553 " MONITORING, REFINERIES, WASTE OIL, WASTEWATERS
 0554 " MONITORING, MARINE ORGANISMS, PREDICTIONS, CONTAMINATION, MARINE ENVIRONMENT
 0555 " BIOASSAY, DETECTION, SAMPLING, CHEMICAL ANALYSIS, WATER QUALITY
 0556 " BEHAVIOR, FISH, INVERTEBRATES, MARINE ORGANISMS, MONITORING, COASTAL WATERS
 0557 " ANNELIDS, HYDROCARBONS, UPTAKE, METABOLISM, MARINE ORGANISMS, MOLLUSKS, CRUSTACEANS, *DETOXIFICATION MECHANISMS
 0558 " BIODEGRADATION, BARENTS SEA, ARCTIC, MICROORGANISMS, CONTAMINATION
 0559 " MOLLUSKS, ECONOMICS, FISHERIES, *LITTLENECK CLAMS
 0560 " BENTHOS, BASELINE STUDIES, ALASKA, BIOASSAY, SEDIMENTS, OCS
 0561 " MONITORING, MARINE ENVIRONMENT, ENVIRONMENTAL EFFECTS, OIL DISCHARGES, INDUSTRIES, UK
 0562 " BIODEGRADATION, METABOLISM, FISH, MONITORING
 0563 " BIOLOGICAL EFFECTS, CRUDE OIL, SOLUTION, WSP, SEAWATER, MARINE ORGANISMS
 0564 " BIOASSAY, BEACH CLEANUP, DISPERSANTS, TOXICITY, INTERTIDAL ZONE, PERFORMANCE TESTING
 0565 " SPILL RESPONSE, WILDLIFE, CONTINGENCY PLANNING, GOVERNMENT AGENCIES, PERSONNEL TRAINING, *USFWS, *WORKSHOP
 0566 " CRUDE OIL, TOXICITY, CRUSTACEANS, *LOBSTERS
 0567 " DISPERSANTS, BIRDS, *HALLARD EMBRYOS, *HATCHABILITY
 0568 " DISPERSANTS, CRUDE OIL, TOXICITY, BIRDS, WILDLIFE, *CORVET 9527, *HALLARD DUCKS
 0569 " AROMATIC HYDROCARBONS, ALGAE, CRUDE OIL, FUEL OIL, TOXICITY, MICROORGANISMS, *DIATOMS
 0570 " MOLLUSKS, HYDROCARBONS, *MYTILUS EDULIS
 0571 " EKOFISK BLOWOUT, NORTH SEA, ZOOPLANKTON, FISH, *EGGS AND LARVAE
 0572 " MOLLUSKS, WSP, HYDROCARBONS, CONCENTRATIONS, CALIFORNIA, *CYSSAL TERTIAL FORMATION
 0573 " ALGAE, CRUDE OIL, CONCENTRATIONS, METABOLISM, TOXICITY
 0574 " WSP, TOXICITY, MORTALITY, CRUSTACEANS
 0575 " ARCTIC, CRUDE OIL, PHYTOPLANKTON, ZOOPLANKTON, *TUNDRA PONDS
 0576 " BACTERIA, CRUDE OIL, FISH, *MULLET, *FIN PROSION, *BACTERIOLOGICAL ASPECTS
 0577 " TOXICITY, BIRDS, *JAPANESE QUAIL, *CANADA GESE, *EGG HATCHABILITY

0305 BIOLOGICAL EFFECTS, AMOCO CADIZ SPILL, SUBLETHAL EFFECTS, ZOOPLANKTON, *NESTON,
 *RESPIRATION, *PRIMARY PRODUCTION
 0306 " FISHERIES, REFINERIES, JAPAN, *SETO INLAND SEA, *MARICULTURE, *SEAWEEDES
 0311 " CRUDE OIL, BIRDS, MORTALITY, *MALLARD DUCKS, *COLD AND SEAWATER STRESS
 0313 " MARINE ORGANISMS, HYDROCARBONS, ECOSYSTEMS, HABITATS
 0314 " HYDROCARBONS, DISTRIBUTION, SAMPLING, PHYTOPLANKTON, GROWTH
 0321 " BACTERIA, CRUDE OIL, *CLOSED SYSTEMS, *BACTERIAL SUCCESSIONS
 0323 " PETROLEUM PRODUCTS, DEVELOPMENT, METABOLISM, *PORPHYRA
 0324 " ACUTE EFFECTS, METABOLISM, FISH, STATISTICAL ANALYSIS
 0329 " PETROLEUM PRODUCTS, MARINE ORGANISMS, MICROORGANISMS, MARINE ENVIRONMENT
 0330 " ECOSYSTEMS, MARINE ORGANISMS, PETROLEUM PRODUCTS
 0332 " EKOFISK BLOWOUT, NORTH SEA, PLANKTON
 0333 " OIL SPILLS, PLANKTON, NORTH SEA
 0338 " CRUDE OIL, GROWTH, DEVELOPMENT, MOLLUSKS, *MYTILUS EDULIS
 0344 " ARCTIC, METABOLISM, VEGETATION, SOIL, *TUNDRA, *ROOTS, *SOIL CELLULOSE
 0348 " FUEL OIL, DISPERSANTS, UPTAKE, FISH
 0351 " BACTERIA, DISPERSANTS, MICROORGANISMS, STATISTICAL ANALYSIS, PRODUCT INFORMATION
 0357 " MOLLUSKS, METABOLISM, UPTAKE, *MYTILUS GALLPROVINCIALIS
 0359 " ENVIRONMENTAL EFFECTS, ECOSYSTEMS, WILDLIFE, SPA, *USFWS
 0360 " PORTS, PETROCHEMICALS, MEDITERRANEAN SEA, CRUSTACEANS, *BARNACLES
 0369 " ARCTIC, MARINE ORGANISMS, CRUDE OIL
 0371 " IXTOC 1 BLOWOUT, GULF OF MEXICO, BIRDS, INVERTEBRATES, MARINE ORGANISMS
 0372 " MARINE ENVIRONMENT, DENMARK, LEGISLATION
 0373 " CRUDE OIL, REPRODUCTION, *CORALS, *STYLCPHORA PISTILLATA
 0376 " AMOCO CADIZ SPILL, BIOMASS, ZOOPLANKTON, COASTAL WATERS, FRANCE
 0378 " ARCTIC, CRUDE OIL, SOIL, MICROORGANISMS, *DENITRIFICATION, *NITROGEN FIXATION
 0385 " BACTERIA, ALASKA, CRUDE OIL, FUNGI, SOIL, *HOT OIL, *TALGA SOIL
 0386 " BENTHOS, NATURAL SEEPAGE, DISTRIBUTION, MARINE ORGANISMS, MICROORGANISMS, SANTA
 BARBARA CHANNEL
 0397 " SEDIMENTS, MICROORGANISMS, *MICROBIAL ACTIVITY
 0399 " PSP, CRUDE OIL, UPTAKE, METABOLISM, FOOD WEB, *RETENTION
 0401 " ATLANTIC COAST, MOLLUSKS, MAINE, *OIL SPILL SITES, *MYA ARENARIA, *NEOPLASMS
 0446 " BASELINE STUDIES, FISHERIES, RESOURCE MANAGEMENT, BIRDS, MARINE MAMMALS, FISH,
 LABRADOR SEA
 0461 " HYDROCARBONS, MARINE ORGANISMS, CONTAMINATION, BOOK REVIEW
 0463 " BIODEGRADATION, BEAUFORT SEA, BASELINE STUDIES, ARCTIC, CRUDE OIL, MICROORGANISMS,
 CANADA
 0477 " UK, FISHERIES, ESTUARIES
 0480 " BEHAVIOR, BEACHES, CRUDE OIL, MARINE ENVIRONMENT, FATE, COASTS, BIRDS, FISH,
 MARINE ORGANISMS, HEALTH HAZARDS
 0484 " CONTAMINATION, OFFSHORE, MARINE ENVIRONMENT, ESTUARIES, MODELS, ENVIRONMENTAL
 EFFECTS, *PROCEEDINGS
 0500 " AROMATIC HYDROCARBONS, CRUSTACEANS, *CRAYFISH, *PHYSIOLOGICAL EFFECTS, *NAPHTHALENE
 0536 " BIODEGRADATION, ARCTIC, MICROORGANISMS, SOIL, CRUDE OIL, FATE, *TUNDRA
 0584 " NATURAL SEEPAGE, FATE, HYDROCARBONS, GULF OF MEXICO, CARIBBEAN SEA
 0605 " OIL SHALE, WASTEWATERS, EXTRACTION, CONCENTRATIONS, METABOLISM
 0611 " ONSHORE, FISH, WILDLIFE, DEVELOPMENT, CANADA, *ALBERTA
 0612 " BENTHOS, TOXICITY, OFFSHORE, DRILLING, ESTUARIES, MARINE ORGANISMS, *BIOCIDES
 0633 " REFINERIES, ENVIRONMENTAL EFFECTS, ESTUARIES, MOLLUSKS, FISHERIES, CHESAPEAKE BAY,
 *OYSTERS
 0720 " WASTE OIL, DISPOSAL, LAND FARMING, CRUDE OIL, FUEL OIL, CRANKCASE OIL,
 MONITORING, PLANTS, SOIL
 0737 " TOXICITY, WASTEWATERS, REFINERIES, *TOXICITY TESTING
 0738 " HYDROCARBONS, PHYTOPLANKTON, MARINE ENVIRONMENT, BIOMASS, *GUPEX EXPERIMENT
 0715 BIOLOGICAL TREATMENT, REFINERIES, PETROCHEMICALS, WASTEWATER TREATMENT
 0726 " WASTEWATER TREATMENT, OIL REMOVAL, SLUDGE, INDUSTRIES
 0355 BIOMASS, ARCTIC, ALGAE, CRUDE OIL, METABOLISM, PLANKTON, LAKES
 0376 " BIOLOGICAL EFFECTS, AMOCO CADIZ SPILL, ZOOPLANKTON, COASTAL WATERS, FRANCE
 0430 " BIOINDICATORS, BENTHOS, BASELINE STUDIES, ALASKA, SEDIMENTS, OCS
 0738 " BIOLOGICAL EFFECTS, HYDROCARBONS, PHYTOPLANKTON, MARINE ENVIRONMENT, *GUPEX
 EXPERIMENT
 0069 BIRDS, ANALYTICAL TECHNIQUES, HYDROCARBONS, CHROMATOGRAPHY, SPECTROSCOPY, *MALLARD
 DUCKS
 0189 " RESTORATION, *BIRD REHABILITATION
 0203 " SPILL RESPONSE, GOVERNMENT AGENCIES, FISHERIES, UK, *ELENI V SPILL
 0222 " SPILL RESPONSE, POLLUTION CONTROL, GOVERNMENT AGENCIES, CONTINGENCY PLANNING,
 CALIFORNIA
 0239 " BALLAST, SPILL RESPONSE, POLLUTION CONTROL, OIL DISCHARGES, TANKERS, SPILL
 COOPERATIVES, OIL INDUSTRY
 0247 " POLLUTION PREVENTION, WILDLIFE, RESTORATION, HABITATS
 0252 " POLLUTION PREVENTION, OIL SPILLS, *DETERGENT DEVICES
 0256 " CRUDE OIL, FUEL OIL, REPRODUCTION, *CASSINS AUKLETS
 0257 " BIOLOGICAL EFFECTS, DISPERSANTS, *MALLARD EMBRYOS, *HATCHABILITY
 0258 " ANALYTICAL TECHNIQUES, CHRONIC EFFECTS, SUBLETHAL EFFECTS

0259 BIRDS, BIOLOGICAL EFFECTS, DISPERSANTS, CRUDE OIL, TOXICITY, WILDLIFE, *COREXIT 9527,
 *MALLARD DUCKS
 0264 " TOXICITY, MORTALITY, FUEL OIL, NORWAY, *BRUNNICH'S GUILLEMOTS
 0274 " BIBLIOGRAPHIES, BOOK REVIEW, PHYSICAL EFFECTS, *USFWS
 0275 " OIL SPILLS, FUEL OIL, COASTS, MARINE ORGANISMS, SCOTLAND
 0279 " OIL SLICKS, MORTALITY, COASTAL WATERS, HARBORS, UK
 0288 " ANALYTICAL TECHNIQUES, ACUTE EFFECTS, HYDROCARBONS, CHRONIC EFFECTS, TOXICITY,
 MORTALITY, WILDLIFE
 0292 " METABOLISM, DEVELOPMENT, CHRONIC EFFECTS, CONTAMINATION, *USFWS, *PATIENT
 WILDLIFE RESEARCH CENTER
 0294 " ACUTE EFFECTS, CRUDE OIL, REPRODUCTION, *FOOD INTAKE
 0301 " GROWTH, CRUDE OIL, TOXICITY
 0303 " BIOLOGICAL EFFECTS, TOXICITY, *JAPANESE QUAIL, *CANADA GESE, *EGG HATCHABILITY
 0308 " AROMATIC HYDROCARBONS, TOXICITY, GROWTH, *MALLARD DUCKS
 0309 " CRUDE OIL, TOXICITY, GROWTH, DEVELOPMENT, *MALLARD DUCKS, *NICKEL, *VANADIUM
 0310 " METABOLISM, HYDROCARBONS, *MALLARD DUCKS, *HYPOADRENOCORTICALISM
 0311 " BIOLOGICAL EFFECTS, CRUDE OIL, MORTALITY, *MALLARD DUCKS, *COLD AND SEAWATER STRESS
 0319 " AMOCO CADIZ SPILL, MORTALITY, ENGLISH CHANNEL, FRANCE
 0325 " MORTALITY, REPRODUCTION, FUEL OIL, *LAUGHING GULLS
 0326 " MORTALITY, MARSHES, CONTAMINATION, TOXICITY, *RESUSPENSION
 0342 " ATLANTIC COAST, ARGO MERCHANT SPILL, OIL SPILLS, CANADA, COLD CLIMATE, CHEMICAL
 ANALYSIS, CONTAMINATION, *GRANT ZENITH SPILL
 0352 " AMOCO CADIZ SPILL, MORTALITY, UK, *AUKS
 0363 " REFINERIES, FISHERIES, MARINE MAMMALS, MAINE
 0365 " SUBLETHAL EFFECTS, HYDROCARBONS, *MALLARD DUCKS, *HEPATIC FUNCTION
 0371 " BIOLOGICAL EFFECTS, IXTOC 1 BLOWOUT, GULF OF MEXICO, INVERTEBRATES, MARINE
 ORGANISMS
 0375 " TOXICITY, MORTALITY, UK
 0390 " ANALYTICAL TECHNIQUES, TOXICITY, HYDROCARBONS, GROWTH, DEVELOPMENT, UPTAKE,
 DEGRADATION, *RESEARCH REVIEW
 0400 " TOXICITY, FUEL OIL, REPRODUCTION, *JAPANESE QUAIL
 0436 " BEACHES, BASELINE STUDIES, ATLANTIC COAST, CONTAMINATION, OFFSHORE, EXPLORATION
 0446 " BIOLOGICAL EFFECTS, BASELINE STUDIES, FISHERIES, RESOURCE MANAGEMENT, MARINE
 MAMMALS, FISH, LABRADOR SEA
 0480 " BIOLOGICAL EFFECTS, BEHAVIOR, BEACHES, CRUDE OIL, MARINE ENVIRONMENT, FATE,
 COASTS, FISH, MARINE ORGANISMS, HEALTH HAZARDS
 0491 " BIODEGRADATION, BEHAVIOR, AMOCO CADIZ SPILL, FATE, MONITORING, SEDIMENTS,
 SEAWATER, MICROORGANISMS, TOXICITY, FISH
 0507 " OIL DISCHARGES, COASTAL WATERS, FINLAND
 0680 " OIL TRANSFER, LEAKAGE, OIL SHALE, DISPERSANTS, MORTALITY
 0222 BLOWOUT PREVENTION, BIBLIOGRAPHIES, SPILL CLEANUP, POLLUTION PREVENTION, POLLUTION
 CONTROL, EQUIPMENT
 0195 BLOWOUTS, BEAUFORT SEA, ARCTIC, CONTINGENCY PLANNING, SPILL RESPONSE, ICE, SPILL
 CONTAINMENT
 0196 " ARCTIC, CONTINGENCY PLANNING, SPILL RESPONSE, OFFSHORE, DRILLING, CANADA
 0201 " ARCTIC, CONTINGENCY PLANNING, PREDICTIONS, OFFSHORE, CANADA
 0217 " CONTINGENCY PLANNING, RISK ANALYSIS, LABRADOR SEA
 0220 " IXTOC 1 BLOWOUT, PLATFORMS, SPILL RESPONSE
 0230 " SPILL RESPONSE, MONITORING
 0231 " POLLUTION CONTROL, REGULATIONS, EQUIPMENT, PRODUCT INFORMATION, INTERNATIONAL
 AGREEMENTS, OIL-WATER SEPARATION
 0241 " POLLUTION CONTROL, OFFSHORE, PRODUCTION, PLATFORMS, LOUISIANA
 0417 " BEHAVIOR, PHYSICAL ASPECTS, SEAWATER, SEA SURFACE, MOVEMENT, FATE
 0444 " BASELINE STUDIES, ENVIRONMENTAL EFFECTS, OCS, DRILLING, CANADA, LABRADOR SEA,
 *NEWFOUNDLAND
 0445 " BASELINE STUDIES, ENVIRONMENTAL EFFECTS, OCS, LABRADOR SEA, CANADA, *BIOLOGICAL
 DESCRIPTIONS
 0559 " BASELINE STUDIES, SIMULATIONS, LABRADOR SEA, CANADA, SPILL RESPONSE, CONTINGENCY
 PLANNING
 0565 " PREDICTIONS, PHYSICAL ASPECTS, ICE, LABRADOR SEA, CANADA
 0581 " BEHAVIOR, FATE, CRUDE OIL, OIL DISCHARGES, EKOFISK BLOWOUT, NORTH SEA, OFFSHORE
 0631 " OFFSHORE, OCS, PLATFORMS, PRODUCTION, STATISTICS
 0638 " OFFSHORE, OIL INDUSTRY, DEVELOPMENT, PRODUCTION, PLATFORMS, SPILL RESPONSE, SPILL
 CLEANUP, SAFETY
 0251 BOOK REVIEW, BASELINE STUDIES, ARCTIC, CONTINGENCY PLANNING, MARINE ENVIRONMENT,
 CANADA, LABRADOR SEA
 0274 " BIRDS, BIBLIOGRAPHIES, PHYSICAL EFFECTS, *USFWS
 0327 " TOXICITY, MARINE ORGANISMS, HYDROCARBONS, PETROLEUM PRODUCTS, METABOLISM,
 SUBLETHAL EFFECTS
 0461 " BIOLOGICAL EFFECTS, HYDROCARBONS, MARINE ORGANISMS, CONTAMINATION
 0470 " BIODEGRADATION, AQUATIC ENVIRONMENT, ANALYTICAL TECHNIQUES, SOURCES, FATE,
 CONTAMINATION
 0483 " AMOCO CADIZ SPILL, CHRONIC EFFECTS, ENVIRONMENTAL EFFECTS
 0499 " BEHAVIOR, HYDROCARBONS, FATE, POLLUTION CONTROL, COST ANALYSIS, ENVIRONMENTAL
 EFFECTS

0505 BOOK REVIEW, ENVIRONMENTAL EFFECTS, OIL SPILLS, EXPLORATION, PRODUCTION
 0721 " WASTEWATERS, DISPOSAL, WASTE OIL, LAND FARMING, INDUSTRIES
 0131 BOOMS, SPILL CONTAINMENT, DESIGN-ENGINEERING, EQUIPMENT, PATENT
 0133 " SPILL CONTAINMENT, DESIGN-ENGINEERING, PERFORMANCE TESTING, *AIR JET BOOM
 0134 " SPILL CONTAINMENT, DESIGN-ENGINEERING, PERFORMANCE TESTING, UK
 0135 " SPILL CONTAINMENT, PHYSICAL ASPECTS, OIL SLICKS
 0137 " SPILL CONTAINMENT, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL, PATENT
 0140 " BEACH CLEANUP, SPILL CLEANUP, EQUIPMENT, SKIMMERS
 0169 " SPILL CONTAINMENT, SPILL CLEANUP, SKIMMERS, EQUIPMENT, DESIGN-ENGINEERING,
 PERFORMANCE TESTING, UK
 0208 " SPILL CONTAINMENT, SPILL CLEANUP, EQUIPMENT, SKIMMERS, *DEPLOYMENT METHODS
 0165 BURNING, BEACH CLEANUP, SORBENTS, SOIL, CRUDE OIL, *RESIDUAL OILS, *SINKING
 0194 " ARCTIC, PERFORMANCE TESTING, SPILL REMOVAL, ICE, *COMBUSTION PROMOTERS
 0234 " SPILL REMOVAL, PERFORMANCE TESTING, EQUIPMENT, COLD CLIMATES, CANADA, *INCENDIARY
 DEVICES
 0479 " BEAUFORT SEA, ARCTIC, OIL SPILLS, POLLUTION CONTROL, OIL REMOVAL
 0510 " ARCTIC, PETROLEUM PRODUCTS, WEATHERING, *CHEMICAL-PHYSICAL ASPECTS,
 *COMBUSTIBILITY, *RESIDUAL OILS
 0593 " BEHAVIOR, ARCTIC, FATE, ICE, EQUIPMENT, PERFORMANCE TESTING
 0667 " BEACHES, OIL SPILLS, TEXAS, COASTAL WATERS, *BURNING AGATE SPILL
 0711 " SPILL CLEANUP, POLLUTION CONTROL, RECLAMATION, WASTE OIL TREATMENT, LAND FARMING
 0596 BUZZARDS BAY, ARCTIC, OIL SPILLS, *COMPARISON STUDY
 0190 CALIFORNIA, PERSONNEL TRAINING, PERFORMANCE TESTING, EQUIPMENT, SPILL CLEANUP,
 DISPERSANTS, OIL INDUSTRY, USCG
 0222 " BIRDS, SPILL RESPONSE, POLLUTION CONTROL, GOVERNMENT AGENCIES, CONTINGENCY PLANNING
 0243 " POLLUTION CONTROL, REGULATIONS, WASTEWATERS, OIL DISCHARGES, INDUSTRIES
 0280 " BIOLOGICAL EFFECTS, MOLLUSKS, WSP, HYDROCARBONS, CONCENTRATIONS, *BYSSAL THREAD
 FORMATION
 0391 " PETROLEUM PRODUCTS, MOLLUSKS, MORTALITY, TOXICITY, PACIFIC COAST, GULF OF ALASKA
 0595 " NATURAL SEEPAGE, TAR, SANTA BARBARA CHANNEL, OFFSHORE, ONSHORE, *ASPHALT DEPOSITS
 0692 " HYDROCARBONS, OIL TRANSPORT, PORTS, HARBORS, OIL TRANSFER
 0735 " WASTE OIL, RECYCLING, DISPOSAL, REGULATIONS, LEGISLATION, US, *MINNESOTA, *UTAH
 0749 " NAUVE ORGANISMS, DISTRIBUTION, PLATFORMS, COASTAL WATERS, OFFSHORE, HABITATS
 0009 CANADA, DETECTION, SOURCE IDENTIFICATION, PAH, SEDIMENTS, COASTS, *SHELLFISH,
 *CREOSOTE, *WHARF STRUCTURES
 0020 " ARCTIC, DETECTION, CONCENTRATIONS, HYDROCARBONS, SEAWATER, SEDIMENTS, *BAFFIN BAY
 0030 " ARCTIC, HYDROCARBONS, SEAWATER, *HARMOT BASIN
 0034 " ANALYTICAL TECHNIQUES, REMOTE SENSING, SOURCE IDENTIFICATION, OIL SLICKS,
 *FLUORESCENCE
 0045 " ARCTIC, REMOTE SENSING, NATURAL SEEPAGE, DETECTION, COASTAL WATERS
 0054 " CHEMICAL ANALYSIS, CONCENTRATIONS, PAH, OXIDATION, FRESHWATER, GROUNDWATER,
 *ONTARIO
 0136 " OIL SPILLS, SPILL CONTAINMENT, PERFORMANCE TESTING, ONSHORE, *AIR SPARGING
 SYSTEMS, *FEASIBILITY STUDY
 0150 " BEAUFORT SEA, ARCTIC, DISPERSANTS, SPILL REMOVAL
 0179 " ARCTIC, SPILL CLEANUP, SKIMMERS, DESIGN-ENGINEERING, PERFORMANCE TESTING, COLD
 CLIMATES, *ANOP
 0192 " BEHAVIOR, PERSONNEL TRAINING, CONTINGENCY PLANNING, SPILL RESPONSE, COASTS, OIL
 SPILLS, *WORKSHOPS
 0196 " BLOWOUTS, ARCTIC, CONTINGENCY PLANNING, SPILL RESPONSE, OFFSHORE, DRILLING
 0201 " BLOWOUTS, ARCTIC, CONTINGENCY PLANNING, PREDICTIONS, OFFSHORE
 0205 " CONTINGENCY PLANNING, PREDICTIONS, SPILL RESPONSE, GOVERNMENT AGENCIES, OIL
 INDUSTRY, EQUIPMENT, OFFSHORE, EXPLORATION, LABRADOR SEA
 0210 " BASELINE STUDIES, ARCTIC, CONTINGENCY PLANNING, MARINE ENVIRONMENT, LABRADOR SEA,
 *INFORMATION ATLAS
 0211 " CONTINGENCY PLANNING, SPILL RESPONSE, OIL INDUSTRY, ONSHORE, EQUIPMENT, *PRAIRIES
 0219 " BEAUFORT SEA, ATLANTIC COAST, ARCTIC, ICE, SPILL RESPONSE, SPILL CLEANUP,
 *WORKSHOP OPINION SURVEY
 0224 " SPILL RESPONSE, LABRADOR SEA, COASTS, *LOGISTICS, *SUPPORT SERVICES
 0234 " BURNING, SPILL REMOVAL, PERFORMANCE TESTING, EQUIPMENT, COLD CLIMATES, *INCENDIARY
 DEVICES
 0251 " BOOK REVIEW, BASELINE STUDIES, ARCTIC, CONTINGENCY PLANNING, MARINE ENVIRONMENT,
 LABRADOR SEA
 0342 " BIRDS, ATLANTIC COAST, ARGO MERCHANT SPILL, OIL SPILLS, COLD CLIMATE, CHEMICAL
 ANALYSIS, CONTAMINATION, *GRANT ZENITH SPILL
 0368 " ARCTIC, CRUDE OIL, INVERTEBRATES, MARINE ORGANISMS
 0431 " BEAUFORT SEA, BASELINE STUDIES, BACTERIA, ARCTIC, DISTRIBUTION
 0437 " BASELINE STUDIES, ARCTIC, MARINE ENVIRONMENT
 0443 " BASELINE STUDIES, ENVIRONMENTAL EFFECTS, SPILL RESPONSE, MOVEMENT, PREDICTIONS,
 OCS, DRILLING, LABRADOR SEA, *TRAJECTORIES, *NEWFOUNDLAND
 0444 " BLOWOUTS, BASELINE STUDIES, ENVIRONMENTAL EFFECTS, OCS, DRILLING, LABRADOR SEA,
 *NEWFOUNDLAND
 0445 " BLOWOUTS, BASELINE STUDIES, ENVIRONMENTAL EFFECTS, OCS, LABRADOR SEA, *BIOLOGICAL
 DESCRIPTIONS

0454 CANADA, INTERNATIONAL AGREEMENTS, LEGISLATION, POLLUTION CONTROL, MARINE ENVIRONMENT,
COASTAL WATERS

0463 " BIOLOGICAL EFFECTS, BIODEGRADATION, BEAUFORT SEA, BASELINE STUDIES, ARCTIC, CRUDE
OIL, MICROORGANISMS

0517 " BIODEGRADATION, ARCTIC, CRUDE OIL, PLANTS, MARINE ORGANISMS

0559 " BLOWOUTS, BASELINE STUDIES, SIMULATIONS, LABRADOR SEA, SPILL RESPONSE, CONTINGENCY
PLANNING

0565 " BLOWOUTS, PREDICTIONS, PHYSICAL ASPECTS, ICE, LABRADOR SEA

0611 " BIOLOGICAL EFFECTS, ONSHORE, FISH, WILDLIFE, DEVELOPMENT, *ALBERTA

0614 " ARCTIC, CHEMICAL ANALYSIS, CHEMICAL EFFECTS, TOXICITY, DRILLING, OFFSHORE,
EXPLORATION, WASTEWATER DISPOSAL, *DRILLING MUDS

0620 " ECONOMICS, SOCIOECONOMIC EFFECTS, OFFSHORE, EXPLORATION, DRILLING

0644 " OFFSHORE, DRILLING, SAFETY, ENVIRONMENTAL EFFECTS, PREDICTIONS, *LANCASTER SOUND

0652 " WASTEWATERS, DISPOSAL, ENVIRONMENTAL EFFECTS, ONSHORE IMPACTS, *DRILLING MUDS,
*ALBERTA

0683 " PORTS, PACIFIC COAST, ENVIRONMENTAL EFFECTS, OIL TRANSFER, OIL TRANSPORT, FISH
ANALYSIS

0684 " PORTS, PACIFIC COAST, ENVIRONMENTAL EFFECTS, OIL TRANSFER, OIL TRANSPORT, RISK
ANALYSIS

0088 CARCINOGENS, CONCENTRATIONS, PAH, PETROLEUM PRODUCTS, UPTAKE, MOLLUSKS, OREGON,
*MUSSELS

0291 " PAH, UPTAKE, FISH, MOLLUSKS, CRUSTACEANS, CONTAMINATION, *COMMERCIAL SEAFOODS,
*CREOSOTE

0469 " TOXICITY, PAH, ENVIRONMENTAL EFFECTS

0599 " BIOASSAY, AROMATIC HYDROCARBONS, OIL SHALE, CRUDE OIL, FOSSIL FUELS, HEALTH
HAZARDS, *PNA

0600 " PETROLEUM PRODUCTS, TAR, OIL SHALE, CRUDE OIL, HEALTH HAZARDS, USSR,
*BENZO(A)PYRENE, *ESTONIA

0601 " HEALTH HAZARDS, OIL SHALE, TAR, WASTEWATERS, EXTRACTION, USSR, *PHENOLS, *ESTONIA

0602 " OIL SHALE, HEALTH HAZARDS, MORTALITY, EXTRACTION, OIL INDUSTRY, US, *SHALE OIL
WORKERS

0607 " MUTAGENS, CRUDE OIL, PAH, OIL SHALE, OIL INDUSTRY

0608 " OIL SHALE, CHRONIC EFFECTS, EXTRACTION, OIL INDUSTRY, USSR, *CANCER INCIDENCE,
*ESTONIA

0465 CARIBBEAN SEA, ENVIRONMENTAL EFFECTS, OIL SPILLS, PUERTO RICO

0584 " BIOLOGICAL EFFECTS, NATURAL SEEPAGE, FATE, HYDROCARBONS, GULF OF MEXICO

0661 " TANKERS, OIL SLICKS, POLLUTION CONTROL, SPILL RESPONSE

0673 " SPILL RESPONSE, DISPERSANTS, OIL INDUSTRY, TANKERS, *AEGEAN CAPTAIN SPILL,
*ATLANTIC EXPRESS SPILL

0322 CASPIAN SEA, TOXICITY, CRUDE OIL, MOLLUSKS, USSR, FILTRATION, GROWTH, CONTAMINATION

0003 CHEMICAL ANALYSIS, BIOGENIC HYDROCARBONS, HYDROCARBONS, CONCENTRATIONS, CHROMATOGRAPHY

0019 " CHROMATOGRAPHY, PAH, DETECTION

0024 " ANIMALS, PAH, DETECTION

0029 " BIOINDICATORS, BIOASSAY, DETECTION, SAMPLING, WATER QUALITY

0052 " ANALYTICAL TECHNIQUES, FATE, HYDROCARBONS, SAMPLING, DISTRIBUTION

0054 " CANADA, CONCENTRATIONS, PAH, OXIDATION, FRESHWATER, GROUNDWATER, *ONTARIO

0056 " ATLANTIC COAST, SAMPLING, PAH, OCS, SEDIMENTS, HYDROCARBONS

0057 " ATLANTIC OCEAN, HYDROCARBONS, SEAWATER, GEORGE'S BANK

0058 " HYDROCARBONS, DISPERSION, DISPERSANTS, CONCENTRATIONS

0061 " AMOCO CADIZ SPILL, CRUDE OIL, WSP, SEAWATER

0063 " SPECTROSCOPY, SEAWATER

0066 " CONCENTRATIONS, HYDROCARBONS, FRESHWATER, *GOA

0067 " DETECTION, CONCENTRATIONS, PAH, MOLLUSKS, *MUSSELS

0070 " CHROMATOGRAPHY, PAH, SAMPLING

0072 " AROMATIC HYDROCARBONS, CHROMATOGRAPHY, MOLLUSKS, *OYSTERS

0074 " HYDROCARBONS, SEDIMENTS, MARINE ENVIRONMENT, CONCENTRATIONS, *NATIONAL BUREAU OF
STANDARDS

0076 " HYDROCARBONS, DETECTION, SEDIMENTS, *INTERLABORATORY COMPARISON

0078 " ARGO MERCHANT SPILL, CONCENTRATIONS, HYDROCARBONS, SEDIMENTS, CHROMATOGRAPHY, *TV
FLUORESCENCE

0080 " PAH, *FLUORESCENCE EXCITATION AND EMISSION

0081 " BERING SEA, BEAUFORT SEA, SEDIMENTS, GULF OF ALASKA

0082 " BERING SEA, CHROMATOGRAPHY, SEDIMENTS, GULF OF ALASKA

0086 " AROMATIC HYDROCARBONS, AMOCO CADIZ SPILL, SAMPLING, ZOOPLANKTON

0087 " AROMATIC HYDROCARBONS, CHROMATOGRAPHY, FISH, METABOLISM, *METABOLITES

0090 " SEDIMENTS, PORTS, CONTAMINATION, JAPAN, *OSAKA PORT

0091 " UPTAKE, FISH, CONTAMINATION, CRUDE OIL, GC/MS, *ORGANIC SULFUR COMPOUNDS

0092 " HYDROCARBONS, FISH, MOLLUSKS, *SULFUR COMPOUNDS, *SUSPENSIONS

0094 " AROMATIC HYDROCARBONS, SEDIMENTS, GC/MS, DISTRIBUTION, SOURCES

0095 " DETECTION, PETROLEUM PRODUCTS, EQUIPMENT, *FIELD DEPLOYABLE INSTRUMENT

0097 " MARINE ORGANISMS, PAH, FISH, MOLLUSKS

0099 " BIODEGRADATION, ANALYTICAL TECHNIQUES, OIL INDUSTRY, MARINE ENVIRONMENT

0100 " CHROMATOGRAPHY, HYDROCARBONS, FISH, SEDIMENTS

0101 " BIODEGRADATION, CHROMATOGRAPHY, HYDROCARBONS, *ALKANES

0102 " SPECTROSCOPY, CONTAMINATION

0103 CHEMICAL ANALYSIS, PAH, CRUDE OIL, PETROLEUM PRODUCTS, *BENZO(A)PYRENE
 0104 " SAMPLING, DETECTION, SOURCE IDENTIFICATION, CONTAMINATION, OIL SPILLS
 0108 " SAMPLING, HYDROCARBONS, *FRACTIONATION
 0116 " ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, WEATHERING, SPECTROSCOPY,
 *CORRELATION COEFFICIENTS
 0117 " SOURCE IDENTIFICATION, OIL SPILLS
 0119 " SOURCE IDENTIFICATION, OIL DISCHARGES, TANKERS, OIL SPILLS, CHROMATOGRAPHY,
 SAMPLING, TAR
 0123 " SOURCE IDENTIFICATION, OIL SPILLS, *SULFUR ISOTOPES
 0129 " SOURCE IDENTIFICATION, NATURAL SEEPAGE, CRUDE OIL, WEATHERING, MONITORING
 0286 " AROMATIC HYDROCARBONS, FISH, UPTAKE, METABOLISM, CHROMATOGRAPHY, *COHO SALMON,
 *NAPHTHALENE
 0342 " CANADA, BIRDS, ATLANTIC COAST, ARGO MERCHANT SPILL, OIL SPILLS, COLD CLIMATE,
 CONTAMINATION, *GRANT ZENITH SPILL
 0350 " AROMATIC HYDROCARBONS, FISH, METABOLISM, CHROMATOGRAPHY, *METABOLITES
 0481 " FATE, ENVIRONMENTAL EFFECTS, GUIDELINES, HYDROCARBONS, MARINE ENVIRONMENT
 0482 " SAMPLING, SOURCE IDENTIFICATION, WASTEWATERS, OIL-WATER SEPARATION, *PROCEEDINGS
 0496 " BIODEGRADATION, AMOCO CADIZ SPILL, OXIDATION, CHEMICAL EFFECTS, MARINE ORGANISMS
 0501 " AMOCO CADIZ SPILL, GC/MS, OXIDATION
 0506 " HYDROCARBONS, MARINE ENVIRONMENT, CONCENTRATIONS, SOURCES, TOXICITY, GULF OF
 MEXICO, MARINE ORGANISMS, *VOLATILE LIQUID FRACTIONS
 0530 " BIODEGRADATION, BACTERIA, CRUDE OIL, HYDROCARBONS, SOIL
 0538 " BIODEGRADATION, BACTERIA, CRUDE OIL, *CALM ISOTOPES
 0541 " HYDROCARBONS, MARINE ENVIRONMENT, CONTAMINATION, *FLUOROMETRY
 0571 " NATURAL SEEPAGE, HYDROCARBONS, TAR, SAMPLING, GULF OF MEXICO
 0594 " BIODEGRADATION, CRUDE OIL, WEATHERING, *COMPOSITION
 0610 " TOXICITY, OIL SHALE, EXTRACTION, WASTEWATERS, WATER QUALITY, CHEMICAL EFFECTS
 0614 " CANADA, ARCTIC, CHEMICAL EFFECTS, TOXICITY, DRILLING, OFFSHORE, EXPLORATION,
 WASTEWATER DISPOSAL, *DRILLING MUDS
 0615 " NATURAL SEEPAGE, EXPORTATION, MARINE ENVIRONMENT
 0708 " REFINING, WASTEWATERS, CONTAMINATION, SAMPLING
 0740 " DETECTION, PHYSICAL ASPECTS, HYDROCARBONS, *INTERCALIBRATION WORKSHOP
 0416 CHEMICAL EFFECTS, PHYSICAL ASPECTS, DISPERSION, EMULSIONS
 0496 " CHEMICAL ANALYSIS, BIODEGRADATION, AMOCO CADIZ SPILL, OXIDATION, MARINE ORGANISMS
 0515 " BIODEGRADATION, PHYSICAL ASPECTS, OXIDATION, SPILL CLEANUP, MICROORGANISMS, LAND
 FARMING, *STIMULATION
 0551 " BAYS, FATE, PAH, CONCENTRATIONS, SOURCES, SEDIMENTS, WASHINGTON, ZOOPLANKTON,
 *FECAL PELLETS
 0588 " BIODEGRADATION, BEHAVIOR, PHYSICAL ASPECTS, WEATHERING, FATE, PETROLEUM PRODUCTS,
 MARINE ENVIRONMENT
 0610 " CHEMICAL ANALYSIS, TOXICITY, OIL SHALE, EXTRACTION, WASTEWATERS, WATER QUALITY
 0614 " CHEMICAL ANALYSIS, CANADA, ARCTIC, TOXICITY, DRILLING, OFFSHORE, EXPLORATION,
 WASTEWATER DISPOSAL, *DRILLING MUDS
 2633 CHESAPEAKE BAY, BIOLOGICAL EFFECTS, REFINERIES, ENVIRONMENTAL EFFECTS, ESTUARIES,
 MOLLUSKS, FISHERIES, *OYSTERS
 0003 CHROMATOGRAPHY, CHEMICAL ANALYSIS, BIOGENIC HYDROCARBONS, HYDROCARBONS, CONCENTRATIONS
 0019 " CHEMICAL ANALYSIS, PAH, DETECTION
 0032 " AROMATIC HYDROCARBONS, ANALYTICAL TECHNIQUES, CONCENTRATIONS
 0051 " BENTHOS, ANALYTICAL TECHNIQUES, CRUDE OIL, HYDROCARBONS, INVERTEBRATES, CHRONIC
 EFFECTS, DEPURATION, GC/MS
 0053 " AROMATIC HYDROCARBONS, ANALYTICAL TECHNIQUES, SEAWATER, CONCENTRATIONS, CRUDE OIL
 0069 " BIRDS, ANALYTICAL TECHNIQUES, HYDROCARBONS, SPECTROSCOPY, *MALLARD DUCKS
 0070 " CHEMICAL ANALYSIS, PAH, SAMPLING
 0072 " CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, MOLLUSKS, *OYSTERS
 0074 " CHEMICAL ANALYSIS, ARGO MERCHANT SPILL, CONCENTRATIONS, HYDROCARBONS, SEDIMENTS,
 *UV FLUORESCENCE
 0082 " CHEMICAL ANALYSIS, BERING SEA, SEDIMENTS, GULF OF ALASKA
 0087 " CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, FISH, METABOLISM, *METABOLITES
 0096 " ANALYTICAL TECHNIQUES, OIL INDUSTRY, PAH
 0100 " CHEMICAL ANALYSIS, HYDROCARBONS, FISH, SEDIMENTS
 0101 " CHEMICAL ANALYSIS, BIODEGRADATION, HYDROCARBONS, *ALKANES
 0119 " CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, OIL DISCHARGES, TANKERS, OIL SPILLS,
 SAMPLING, TAR
 0122 " ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, SPECTROSCOPY
 0125 " SOURCE IDENTIFICATION, HYDROCARBONS, *URBAN RUNOFF
 0286 " CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, FISH, UPTAKE, METABOLISM, *COHO SALMON,
 *NAPHTHALENE
 0350 " CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, FISH, METABOLISM, *METABOLITES
 0051 CHRONIC EFFECTS, CHROMATOGRAPHY, BENTHOS, ANALYTICAL TECHNIQUES, CRUDE OIL,
 HYDROCARBONS, INVERTEBRATES, DEPURATION, GC/MS
 0258 " BIRDS, ANALYTICAL TECHNIQUES, SUBLETHAL EFFECTS
 0260 " BENTHOS, BACTERIA, ACUTE EFFECTS, CRUDE OIL, GROWTH, OCS, TEXAS
 0265 " BIOASSAY, CONTAMINATION, MOLLUSKS, CRUDE OIL, ESTUARIES, SEDIMENTS, *OYSTERS
 0282 " CRUDE OIL, ECOSYSTEMS, SIMULATIONS, ESTUARIES, MOLLUSKS, CRUSTACEANS, *OYSTERS,
 *SHRIMP, *ENZYME ACTIVITIES

0283 CHRONIC EFFECTS, CRUDE OIL, ECOSYSTEMS, SIMULATIONS, ESTUARIES, FISH, *STRIPED MULLET,
 *ENZYME ACTIVITIES
 0288 " BIRDS, ANALYTICAL TECHNIQUES, ACUTE EFFECTS, HYDROCARBONS, TOXICITY, MORTALITY,
 WILDLIFE
 0292 " BIRDS, METABOLISM, DEVELOPMENT, CONTAMINATION, *USFWS, *PATIENT WILDLIFE RESEARCH
 CENTER
 0302 " BENTHOS, ECOSYSTEMS, FUEL OIL, *MERL EXPERIMENTS
 0335 " WSP, FUEL OIL, CONCENTRATIONS, TOXICITY, CRUSTACEANS, *MUD CRABS
 0353 " ACUTE EFFECTS, UPTAKE, DEPURATION, FISH, PAH, *ACCUMULATION, *RAINBOW TROUT,
 *NAPHTHALENE
 0356 " ACUTE EFFECTS, MARINE ORGANISMS, CONTAMINATION, OIL SPILLS
 0361 " CRUDE OIL, FUEL OIL, TOXICITY, MORTALITY, MOLLUSKS, DELAWARE, ESTUARIES,
 *CRASSOSTREA VIRGINICA
 0380 " BIOASSAY, TOXICITY, VERTEBRATES, *AMPHIBIANS
 0447 " BASELINE STUDIES, ALASKA, ACUTE EFFECTS, TOXICITY, UPTAKE, DEPURATION,
 *METABOLISM, ORGANISMS, HYDROCARBONS
 0483 " BOOK REVIEW, AMOCO CADIZ SPILL, ENVIRONMENTAL EFFECTS
 0509 " ENVIRONMENTAL EFFECTS, OIL SPILLS
 0585 " HYDROCARBONS, COASTAL WATERS, ENVIRONMENTAL EFFECTS, PORTS, MAINE
 0608 " CARCINOGENS, OIL SHALE, EXTRACTION, OIL INDUSTRY, USSR, *CANCER INCIDENCE, *ESTONIA
 0613 " ANIMALS, OIL SHALE, PETROLEUM PRODUCTS, TOXICITY, HEALTH HAZARDS, USSR, *PHENOLS,
 *ESTONIA
 0700 COALESCENCE, CONTAMINATION, WASTEWATER TREATMENT, OIL-WATER SEPARATION, OIL REMOVAL,
 PATENT
 0728 " OIL-WATER SEPARATION, OIL REMOVAL, FILTRATION, SORBENTS, PRODUCT INFORMATION,
 *MODIFIED PEAT
 0014 COASTAL WATERS, MONITORING, NORWAY
 0038 " AMOCO CADIZ SPILL, REMOTE SENSING, CONTAMINATION, FRANCE
 0045 " CANADA, ARCTIC, REMOTE SENSING, NATURAL SEEPAGE, DETECTION
 0279 " BIRDS, OIL SLICKS, MORTALITY, HARBORS, UK
 0293 " BIOINDICATORS, BEHAVIOR, FISH, INVERTEBRATES, MARINE ORGANISMS, MONITORING
 0312 " BENTHOS, AMOCO CADIZ SPILL, DISTRIBUTION, MORTALITY, SUBLETHAL EFFECTS, MARINE
 ORGANISMS, FRANCE
 0343 " BALTIC SEA, ACUTE EFFECTS, MARINE ORGANISMS, FUEL OIL, *TSESSIS SPILL
 0376 " BIOMASS, BIOLOGICAL EFFECTS, AMOCO CADIZ SPILL, ZOOPLANKTON, FRANCE
 0454 " CANADA, INTERNATIONAL AGREEMENTS, LEGISLATION, POLLUTION CONTROL, MARINE
 ENVIRONMENT
 0467 " ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, FISHERIES, FRANCE
 0474 " AMOCO CADIZ SPILL, MARINE ORGANISMS, PLANTS, SEDIMENTS, SHORELINES
 0478 " AMOCO CADIZ SPILL, FRANCE, ENVIRONMENTAL EFFECTS
 0485 " BAYS, ALASKA, ENVIRONMENTAL EFFECTS, OIL SPILLS, SHORELINES, *VULNERABILITY INDEX
 0507 " BIRDS, OIL DISCHARGES, FINLAND
 0508 " BEHAVIOR, SPILL CLEANUP, LYTOC 1 BLOWOUT, TEXAS, OIL SLICKS, ENVIRONMENTAL EFFECTS
 0525 " BIODEGRADATION, BENTHOS, ANNELIDS, PAH, SEDIMENTS, MICROORGANISMS, *POLYCHAETE
 WORMS
 0567 " ARCTIC, ENVIRONMENTAL EFFECTS, SHORELINES, DISPERSANTS, *EXPERIMENTAL SPILLS
 0585 " CHRONIC EFFECTS, HYDROCARBONS, ENVIRONMENTAL EFFECTS, PORTS, MAINE
 0587 " BIODEGRADATION, PAH, ESTUARIES, UPTAKE, METABOLISM, OXIDATION
 0640 " ENVIRONMENTAL EFFECTS, IN, MARINE ENVIRONMENT, SHIPS, OFFSHORE, DEVELOPMENT,
 *PROCEEDINGS
 0651 " OFFSHORE, EXPLORATION, DEVELOPMENT, ECOSYSTEMS, RESOURCE MANAGEMENT, ECONOMICS,
 LOUISIANA
 0660 " BURNING, BEACHES, OIL SPILLS, TEXAS, *BURMAH AGATE SPILL
 0696 " OIL SPILLS, STATISTICS, USCG, INFORMATION SYSTEMS, US, *1977-1978 DATA
 0743 " OIL SPILLS, INFORMATION SYSTEMS, *NEWSPAPER COVERAGE
 0749 " CALIFORNIA, MARINE ORGANISMS, DISTRIBUTION, PLATFORMS, OFFSHORE, HABITATS
 0597 COASTAL ZONE MANAGEMENT, OIL SPILLS, COASTS, RIVERS, *VULNERABILITY INDEX
 0009 COASTS, CANADA, DETECTION, SOURCE IDENTIFICATION, PAH, SEDIMENTS, *SHELLFISH,
 *CREOSOTE, *WHARF STRUCTURES
 0025 " MONITORING, ENVIRONMENTAL EFFECTS, SHORELINES, *ROCKY SEASHORES
 0059 " BEACHES, SAMPLING, CONCENTRATIONS, SEDIMENTS
 0089 " BAYS, AMOCO CADIZ SPILL, CONCENTRATIONS, HYDROCARBONS, SEAWATER, FRANCE
 0192 " CANADA, BEHAVIOR, PERSONNEL TRAINING, CONTINGENCY PLANNING, SPILL RESPONSE, OIL
 SPILLS, *WORKSHOPS
 0224 " CANADA, SPILL RESPONSE, LABRADOR SEA, *LOGISTICS, *SUPPORT SERVICES
 0275 " BIRDS, OIL SPILLS, FUEL OIL, MARINE ORGANISMS, SCOTLAND
 0405 " BEACHES, TAB, INDIA, *RESIDUAL OILS
 0406 " AMOCO CADIZ SPILL, DISTRIBUTION, PHYSICAL EFFECTS, SHORELINES, SEDIMENTATION,
 INTERTIDAL ZONE, FRANCE
 0409 " ALASKA, SEDIMENTATION, OIL SPILLS, *COASTAL MORPHOLOGY, *POTENTIAL SPILL IMPACTS
 0449 " BEAUFORT SEA, BASELINE STUDIES, ALASKA, FISHERIES, WILDLIFE, OFFSHORE, DEVELOPMENT
 0462 " AMOCO CADIZ SPILL, CONTAMINATION, ESTUARIES, FRANCE
 0475 " AMOCO CADIZ SPILL, ENVIRONMENTAL EFFECTS, SHORELINES, FRANCE, STATISTICS
 0480 " BIRDS, BIOLOGICAL EFFECTS, BEHAVIOR, BEACHES, CRUDE OIL, MARINE ENVIRONMENT, FATE,
 FISH, MARINE ORGANISMS, HEALTH HAZARDS

0493 COASTS, AMOCO CADIZ SPILL, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS, SAMPLING, ECOSYSTEMS, FRANCE, *SPECIAL ISSUE

0503 " AMOCO CADIZ SPILL, ENVIRONMENTAL EFFECTS, FRANCE

0512 " BEHAVIOR, AMOCO CADIZ SPILL, ACUTE EFFECTS, ENVIRONMENTAL EFFECTS, SEDIMENTATION

0524 " BIODegradation, BACTERIA, FRESHWATER, ESTUARIES, NORTH CAROLINA

0597 " COASTAL ZONE MANAGEMENT, OIL SPILLS, RIVERS, *VULNERABILITY INDEX

0634 " DRILLING, ENVIRONMENTAL EFFECTS, OIL SPILLS, ONSHORE IMPACTS, SOCIOECONOMIC EFFECTS

0643 " ALASKA, OCS, DEVELOPMENT, OIL DISCHARGES, ESTUARIES, OFFSHORE, OREGON, WASHINGTON, PACIFIC COAST

0672 " AMOCO CADIZ SPILL, ENVIRONMENTAL EFFECTS, TOXICITY, MARINE ORGANISMS, SPILL CLEANUP, FRANCE

0741 " AMOCO CADIZ SPILL, FRANCE, *DINOFLAGELLATE BLOOMS

0149 COLD CLIMATES, SPILL CLEANUP, EQUIPMENT, SKIMMERS, PERFORMANCE TESTING

0179 " CANADA, ARCTIC, SPILL CLEANUP, SKIMMERS, DESIGN-ENGINEERING, PERFORMANCE TESTING, *AMOP

0234 " CANADA, BURNING, SPILL REMOVAL, PERFORMANCE TESTING, EQUIPMENT, *INCENDIARY DEVICES

0413 " ARCTIC, ICE, SEAWATER, *PERMEABILITY

0434 " BEHAVIOR, BASELINE STUDIES, ALASKA, FATE, MOVEMENT, PHYSICAL EFFECTS, SPREADING, ICE

0573 " PHYSICAL EFFECTS, ENVIRONMENTAL EFFECTS, FATE, MARINE ENVIRONMENT, SUBARCTIC REGIONS

0592 " BEHAVIOR, BEAUFORT SEA, ARCTIC, PHYSICAL ASPECTS, FATE, OIL SPILLS, ICE

0655 " ALASKA, US GOVERNMENT, OIL-GAS LEASING, ENVIRONMENTAL EFFECTS, SPILL RESPONSE

0226 COMPENSATION, OIL SPILLS, LIABILITY, INCO

0453 " GOVERNMENT AGENCIES, STATE GOVERNMENTS, *SPILL DAMAGES

0457 " LIABILITY, OFFSHORE, DEVELOPMENT, ONSHORE, SOURCES, RIVERS, POLLUTION CONTROL, UN, *UNEP CONVENTION

0003 CONCENTRATIONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, BIOGENIC HYDROCARBONS, HYDROCARBONS

0020 " CANADA, ARCTIC, DETECTION, HYDROCARBONS, SEAWATER, SEDIMENTS, *BAPFIN BAY

0023 " AMOCO CADIZ SPILL, DETECTION, SPECTROMETRY, WSP, SEAWATER, ENGLISH CHANNEL

0032 " CHROMATOGRAPHY, AROMATIC HYDROCARBONS, ANALYTICAL TECHNIQUES

0053 " CHROMATOGRAPHY, AROMATIC HYDROCARBONS, ANALYTICAL TECHNIQUES, SEAWATER, CRUDE OIL

0054 " CHEMICAL ANALYSIS, CANADA, PAH, OXIDATION, FRESHWATER, GROUNDWATER, *ONTARIO

0058 " CHEMICAL ANALYSIS, HYDROCARBONS, DISPERSION, DISPERSANTS

0059 " COASTS, BEACHES, SAMPLING, SEDIMENTS

0060 " HYDROCARBONS, TANKERS, SAMPLING, MEDITERRANEAN SEA

0062 " SAMPLING, FRESHWATER, FISH, SEDIMENTS, VEGETATION, DISTRIBUTION, CONTAMINATION, *TETRAALKYLLEAD COMPOUNDS

0065 " AFRICA, MONITORING, TAR, DISTRIBUTION, SAMPLING

0066 " CHEMICAL ANALYSIS, HYDROCARBONS, FRESHWATER, *GOA

0067 " CHEMICAL ANALYSIS, DETECTION, PAH, MOLLUSKS, *MUSSELS

0071 " EKOFISK BLOWOUT, NORTH SEA, HYDROCARBONS, SEAWATER, DETECTION, SAMPLING

0074 " CHEMICAL ANALYSIS, HYDROCARBONS, SEDIMENTS, MARINE ENVIRONMENT, *NATIONAL BUREAU OF STANDARDS

0077 " HYDROCARBONS, SEDIMENTS, SAMPLING, DISTRIBUTION

0079 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, ARGO MERCHANT SPILL, HYDROCARBONS, SEDIMENTS, *UV FLUORESCENCE

0094 " DISTRIBUTION, PAH, SEDIMENTS, SOURCES, *COMBUSTION, *URBAN CENTERS

0098 " CARCINOGENS, PAH, PETROLEUM PRODUCTS, UPTAKE, MOLLUSKS, OREGON, *MUSSELS

0099 " COASTS, BAYS, AMOCO CADIZ SPILL, HYDROCARBONS, SEAWATER, FRANCE

0105 " SAMPLING, OIL SHALE, OIL INDUSTRY, WASTEWATERS, USSR, LAKES, RIVERS, *ESTONIA

0110 " CONTAMINATION, SOURCES, ESTUARIES, CRANKCASE OIL, HYDROCARBONS, REFINERIES, WASTEWATERS, *URBAN RUNOFF

0113 " SAMPLING, HYDROCARBONS, MEDITERRANEAN SEA

0240 " CALIFORNIA, BIOLOGICAL EFFECTS, MOLLUSKS, WSP, HYDROCARBONS, *BYSSAL THREAD FORMATION

0299 " BIOLOGICAL EFFECTS, ALGAE, CRUDE OIL, *METABOLISM, TOXICITY

0335 " CHRONIC EFFECTS, WSP, FUEL OIL, TOXICITY, CRUSTACEANS, *MUD CRABS

0340 " CRUDE OIL, HYDROCARBONS, FISH, GROWTH, DEVELOPMENT, *EMBRYOS, *JAPANESE MEDAKA

0362 " AROMATIC HYDROCARBONS, UPTAKE, DEPURATION, FISH, CRUDE OIL, *ORGANIC SULFUR COMPOUNDS

0374 " BIOASSAY, ALGAE, WSP, HYDROCARBONS, PHYTOPLANKTON

0382 " WSP, CRUDE OIL, DEVELOPMENT, GROWTH, FISH, *PACIFIC HERRING, *EMBRYOS

0388 " ALGAE, TOXICITY, REPRODUCTION

0464 " BENTHOS, WASTEWATERS, OIL FIELDS, SEDIMENTS, MARINE ORGANISMS, HYDROCARBONS, TEXAS, *BRINES

0506 " CHEMICAL ANALYSIS, HYDROCARBONS, MARINE ENVIRONMENT, SOURCES, TOXICITY, GULF OF MEXICO, MARINE ORGANISMS, *VOLATILE LIQUID FRACTIONS

0551 " CHEMICAL EFFECTS, BAYS, FATE, PAH, SOURCES, SEDIMENTS, WASHINGTON, ZOOPLANKTON, *FECAL PELLETS

0555 " MODELS, PREDICTIONS, MOVEMENT, SPILL TRAJECTORIES, WEATHERING, SPREADING

0572 " AQUATIC ENVIRONMENT, ANALYTICAL TECHNIQUES, PAH, HYDROCARBONS, TOXICITY, FATE

0593 " NATURAL SEEPAGE, DISTRIBUTION, HYDROCARBONS, MOLLUSKS, ENVIRONMENTAL EFFECTS, GULF OF MEXICO

0604 CONCENTRATIONS, PLATFORMS, CRUSTACEANS, UPTAKE, DEGRADATION, HYDROCARBONS, GULF OF MEXICO, *BARNACLES, *ALGAE

0605 " BIOLOGICAL EFFECTS, OIL SHALE, WASTEWATERS, EXTRACTION, METABOLISM

0742 " SAMPLING, SOLUBILITY, DISPERSION, HYDROCARBONS, SEAWATER, *WISKEY VS. BLOOPER SAMPLERS

0732 CONSERVATION, WASTE OIL, RECYCLING, REFINING, RESOURCE MANAGEMENT, INDUSTRIES, REGULATIONS

0004 CONTAMINATION, BIOINDICATORS, BIOASSAY, MONITORING, METABOLISM

0006 " SHORELINES, MONITORING, HYDROCARBONS, *HONG KONG

0017 " BIOINDICATORS, MONITORING, MARINE ORGANISMS, PREDICTIONS, MARINE ENVIRONMENT

0036 " REMOTE SENSING, OIL SLICKS, SEA SURFACE, *LASER RADAR

0039 " COASTAL WATERS, AMOCO CADIZ SPILL, REMOTE SENSING, FRANCE

0047 " REMOTE SENSING, DETECTION, DISTRIBUTION, JAPAN, *STRAITS OF TSUJUSHIMA

0050 " REMOTE SENSING, MONITORING, SURVEILLANCE

0062 " CONCENTRATIONS, SAMPLING, FRESHWATER, FISH, SEDIMENTS, VEGETATION, DISTRIBUTION, *TETRAALKYLLEAD COMPOUNDS

0079 " BIODEGRADATION, BACTERIA, ARCTIC, SEAWATER, FRESHWATER, ECOSYSTEMS, CRUDE OIL, GASOLINE, STATISTICAL ANALYSIS

0083 " HYDROCARBONS, SAMPLING

0090 " CHEMICAL ANALYSIS, SEDIMENTS, PORTS, JAPAN, *OSAKA PORT

0091 " CHEMICAL ANALYSIS, UPTAKE, FISH, CRUDE OIL, GC/MS, *ORGANIC SULFUR COMPOUNDS

0093 " SAMPLING, MONITORING, SEAWATER, JAPAN

0102 " CHEMICAL ANALYSIS, SPECTROSCOPY

0104 " CHEMICAL ANALYSIS, SAMPLING, DETECTION, SOURCE IDENTIFICATION, OIL SPILLS

0110 " CONCENTRATIONS, SOURCES, ESTUARIES, CRANKCASE OIL, HYDROCARBONS, BITUMENS, WASTEWATERS, *JEBAN RUNOFF

0130 " SOURCE IDENTIFICATION, ESTUARIES, INDUSTRIES, DELAWARE

0188 " BEACHES, SHORELINES, SEDIMENTS, RESTORATION

0233 " OIL SPILLS, GROUNDWATER, POLLUTION PREVENTION, DISPOSAL, OIL REMOVAL, RECOVERY, RESTORATION

0265 " CHRONIC EFFECTS, BIOASSAY, MOLLUSKS, CRUDE OIL, ESTUARIES, SEDIMENTS, *OYSTERS

0291 " CARCINOGENS, PAH, UPTAKE, FISH, MOLLUSKS, CRUSTACEANS, *COMMERCIAL SEAFOODS, *CREOSOTE

0292 " CHRONIC EFFECTS, BIRDS, METABOLISM, DEVELOPMENT, *USFWS, *PATIENT WILDLIFE RESEARCH CENTER

0296 " BIODEGRADATION, BACTERIA, SEAWATER, STATISTICAL ANALYSIS, JAPAN

0298 " BACTERIAL MICROORGANISMS, SEAWATER, *SUEVIVAL

0322 " CASPIAN SEA, TOXICITY, CRUDE OIL, MOLLUSKS, USSR, FILTRATION, GROWTH

0326 " BIRDS, MORTALITY, NARSHES, TOXICITY, *RESUSPENSION

0342 " CHEMICAL ANALYSIS, CANADA, BIRDS, ATLANTIC COAST, ARGO MERCHANT SPILL, OIL SPILLS, COLD CLIMATE, *GRANT SMITH SPILL

0346 " ANNELIDS, HYDROCARBONS, SEAWATER, SEDIMENTS, UPTAKE, *RELEASE, *ARFENICOLA MARINA, *NAPHTHALENE

0354 " AMOCO CADIZ SPILL, FISHMETS, MOLLUSKS, FISH, CRUSTACEANS, FRANCE

0256 " CHRONIC EFFECTS, ACUTE EFFECTS, MARINE ORGANISMS, OIL SPILLS

0367 " BENTHOS, INDUSTRIES, WASTEWATERS, MARINE ENVIRONMENT

0387 " CRUDE OIL, NORWAY, REPRODUCTION, *GASTROPODS, *LITTORINA LITTOREA

0393 " BIOINDICATORS, BIODEGRADATION, BARENTS SEA, ARCTIC, MICROORGANISMS

0408 " BEACHES, ADSORPTION, DISPERSANTS, SEDIMENTS, CRUDE OIL

0412 " AROMATIC HYDROCARBONS, ADSORPTION, ABSORPTION, FRESHWATER, SEDIMENTS, RIVERS, LAKES

0419 " AMOCO CADIZ SPILL, SHORELINES, TOXICITY, WEATHERING

0436 " BIRDS, BEACHES, BASELINE STUDIES, ATLANTIC COAST, OFFSHORE, EXPLORATION

0450 " BASELINE STUDIES, ALASKA, OCS, DEVELOPMENT, ENVIRONMENTAL EFFECTS

0461 " BOOK REVIEW, BIOLOGICAL EFFECTS, HYDROCARBONS, MARINE ORGANISMS

0462 " COASTS, AMOCO CADIZ SPILL, ESTUARIES, FRANCE

0470 " BOOK REVIEW, BIODEGRADATION, AQUATIC ENVIRONMENT, ANALYTICAL TECHNIQUES, SOURCES, FATE

0484 " BIOLOGICAL EFFECTS, OFFSHORE, MARINE ENVIRONMENT, ESTUARIES, MODELS, ENVIRONMENTAL EFFECTS, *PROCEEDINGS

0487 " GROUNDWATER, EXPLORATION, DEVELOPMENT, DETECTION, MONITORING, UK, *CONFERENCE

0490 " BENTHOS, ALGAE, NORWAY, *OSLO FJORD

0502 " INDUSTRIES, LEAKAGE, OIL DISCHARGES, GROUNDWATER, WASTEWATERS, DISPOSAL

0514 " FATE, ENVIRONMENTAL EFFECTS, HYDROCARBONS, MARINE ORGANISMS, ECOSYSTEMS, NORW

0529 " BIODEGRADATION, ALASKA, CRUDE OIL, LAND FARMING, PLANTS, SOIL, FATE

0541 " CHEMICAL ANALYSIS, HYDROCARBONS, MARINE ENVIRONMENT, *FLUOROMETRY

0554 " MODELS, EPA, FATE

0570 " GROUNDWATER, PETROLEUM PRODUCTS

0576 " ARGO MERCHANT SPILL, FATE, HYDROCARBONS, SEDIMENTS, MODELS, TOXICITY

0637 " ENVIRONMENTAL EFFECTS, *ENHANCED OIL RECOVERY

0676 " PIPELINES, OIL SPILLS, EUROPE, RECOVERY

0700 " COAL-TAR, WASTEWATER TREATMENT, OIL-WATER SEPARATION, OIL REMOVAL, PATENT

0701 " AROMATIC HYDROCARBONS, WASTEWATER TREATMENT, PETROCHEMICALS, *STYRENE MONOMER FACILITY

0702 CONTAMINATION, BIODEGRADATION, WASTEWATER TREATMENT, REFINERIES, OIL-WATER SEPARATION, SLUDGE, FLOCCULATION

0708 " CHEMICAL ANALYSIS, REFINING, WASTEWATERS, SAMPLING

0716 " ABSORPTION, WASTEWATER TREATMENT, OIL REMOVAL, EMULSIONS

0729 " OIL-WATER SEPARATION, EQUIPMENT, PATENT

0739 " BIBLIOGRAPHIES, MEDITERRANEAN SEA, MONITORING

0747 " *POLLUTION, *DEFINITION

0159 CONTINGENCY PLANNING, SPILL CLEANUP, SPILL RESPONSE, PERSONNEL TRAINING, MANUALS, GUIDELINES

0171 " AMOCO CADIZ SPILL, SPILL CLEANUP, SPILL RESPONSE, EQUIPMENT, DISPERSANTS

0191 " PERSONNEL TRAINING, SPILL CLEANUP, OIL REMOVAL, EQUIPMENT

0192 " COSTS, CANADA, BEHAVIOR, PERSONNEL TRAINING, SPILL RESPONSE, OIL SPILLS, *WORKSHOPS

0193 " SPILL RESPONSE, UK, GOVERNMENT AGENCIES

0195 " BLOWOUTS, BEAUFORT SEA, ARCTIC, SPILL RESPONSE, ICE, SPILL CONTAINMENT

0196 " CANADA, BLOWOUTS, ARCTIC, SPILL RESPONSE, OFFSHORE, DRILLING

0197 " BEAUFORT SEA, ARCTIC, SPILL CLEANUP, MANUALS, SPILL RESPONSE, SHORELINES

0199 " SPILL RESPONSE, EQUIPMENT, USCG, INFORMATION SYSTEMS, STATISTICAL ANALYSIS, SIMULATIONS, *LOGISTICS

0201 " CANADA, BLOWOUTS, ARCTIC, PREDICTIONS, OFFSHORE

0202 " GUIDELINES, SPILL RESPONSE, NEW YORK, NEW JERSEY

0205 " CANADA, PREDICTIONS, SPILL RESPONSE, GOVERNMENT AGENCIES, OIL INDUSTRY, EQUIPMENT, OFFSHORE, EXPLORATION, LABRADOR SEA

0206 " SPILL RESPONSE, WILDLIFE, GOVERNMENT AGENCIES, *USFWS

0210 " CANADA, BASELINE STUDIES, ARCTIC, MARINE ENVIRONMENT, LABRADOR SEA, *INFORMATION ATLAS

0211 " CANADA, SPILL RESPONSE, OIL INDUSTRY, ONSHORE, EQUIPMENT, *PRAIRIES

0212 " BIOLOGICAL EFFECTS, SPILL RESPONSE, WILDLIFE, GOVERNMENT AGENCIES, PERSONNEL TRAINING, *USFWS, *WORKSHOP

0213 " SPILL RESPONSE, SPILL CLEANUP, EQUIPMENT

0214 " AMOCO CADIZ SPILL, TANKERS, OIL TANKS, STORAGE, OIL TRANSFER, OIL REMOVAL

0215 " AMOCO CADIZ SPILL, SPILL RESPONSE, FRANCE, *COMMISSION REPORT

0216 " GOVERNMENT AGENCIES, LEGISLATION, USCG, EPA, *FWPCA

0217 " BLOWOUTS, RISK ANALYSIS, LABRADOR SEA

0218 " SPILL RESPONSE, FRANCE

0221 " SPILL RESPONSE, PERSONNEL TRAINING, GOVERNMENT AGENCIES, *USFWS

0222 " CALIFORNIA, BIRDS, SPILL RESPONSE, POLLUTION CONTROL, GOVERNMENT AGENCIES

0223 " INTERNATIONAL CONVENTIONS, OIL SPILLS, DISPERSANTS, INCO, *MALTA CENTRE

0229 " AMOCO CADIZ SPILL, EUROPE, INTERNATIONAL AGREEMENTS, REGULATIONS

0235 " STATISTICS, SOURCES, SPILL RESPONSE, TANKERS, OFFSHORE, *USFWS

0251 " CANADA, BOOK REVIEW, BASELINE STUDIES, ARCTIC, MARINE ENVIRONMENT, LABRADOR SEA

0253 " POLLUTION PREVENTION, RISK ANALYSIS, SAFETY, NORTH SEA, NORWAY

0421 " SOCIOECONOMIC EFFECTS, SPILL CLEANUP

0423 " SOCIOECONOMIC EFFECTS, USCG, ST. LAWRENCE RIVER, SPILL RESPONSE, *NEPCO 140 SPILL

0497 " AMOCO CADIZ SPILL, SPILL RESPONSE, FRANCE, *ISTPM

0559 " CANADA, BLOWOUTS, BASELINE STUDIES, SIMULATIONS, LABRADOR SEA, SPILL RESPONSE

0650 " IXTOC 1 BLOWOUT, MEXICO

0609 CORAL REEFS, OFFSHORE, PLATFORMS, DRILLING, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS, FISHERIES, *DRILLING HULDS

0446 COST ANALYSIS, BEHAVIOR, HYDROCARBONS, FATE, POLLUTION CONTROL, ENVIRONMENTAL EFFECTS

0499 " BOOK REVIEW, BEHAVIOR, HYDROCARBONS, FATE, POLLUTION CONTROL, ENVIRONMENTAL EFFECTS

0635 " ENVIRONMENTAL EFFECTS, CRUDE OIL, OIL INDUSTRY, FISHERIES, FISH, MARINE ORGANISMS, SOCIOECONOMIC EFFECTS

0710 " WASTEWATER TREATMENT, REFINERIES, ECONOMICS, *ACTIVATED CARBON

0110 CRANKCASE OIL, CONTAMINATION, CONCENTRATIONS, SOURCES, ESTUARIES, HYDROCARBONS, REFINERIES, WASTEWATERS, *URBAN RUNCFF

0720 " BIOLOGICAL EFFECTS, WASTE OIL, DISPOSAL, LAND FARMING, CRUDE OIL, PETL OIL, MONITORING, PLANTS, SOIL

0733 " REFINING, WASTE OIL, DISPOSAL, RECLAMATION, RECYCLING

0048 CRUDE OIL, REMOTE SENSING, PETROLEUM PRODUCTS, SOURCE IDENTIFICATION, *LASER FLUORESCENSORS

0051 " CHRONIC EFFECTS, CHROMATOGRAPHY, BENTHOS, ANALYTICAL TECHNIQUES, HYDROCARBONS, INVERTEBRATES, DEPURATION, GC/MS

0053 " CONCENTRATIONS, CHROMATOGRAPHY, AROMATIC HYDROCARBONS, ANALYTICAL TECHNIQUES, SEAWATER

0055 " BIOLOGICAL EFFECTS, SOLUTION, WSP, SEAWATER, MARINE ORGANISMS

0061 " CHEMICAL ANALYSIS, AMOCO CADIZ SPILL, WSP, SEAWATER

0079 " CONTAMINATION, BIODEGRADATION, BACTERIA, ARCTIC, SEAWATER, FRESHWATER, ECOSYSTEMS, GASOLINE, STATISTICAL ANALYSIS

0091 " CONTAMINATION, CHEMICAL ANALYSIS, UPTAKE, FISH, GC/MS, *ORGANIC SULFUR COMPOUNDS

0103 " CHEMICAL ANALYSIS, PAH, PETROLEUM PRODUCTS, *BENZO(A) PYRENE

0129 " CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, NATURAL SEEPAGE, WEATHERING, MONITORING

0145 " BURNING, BEACH CLEANUP, SORBENTS, SOIL, *RESIDUAL OILS, *SINKING

0297 " AMOCO CADIZ SPILL, SPILL RESPONSE, HYDROCARBONS, FRANCE, POLLUTION CONTROL

0255 CRUDE OIL, BIOLOGICAL EFFECTS, TOXICITY, CRUSTACEANS, *LOBSTERS
 0256 " BIRDS, FUEL OIL, REPRODUCTION, *CASSINS AUKLETS
 0259 " BIRDS, BIOLOGICAL EFFECTS, DISPERSANTS, TOXICITY, WILDLIFE, *CORPUS 9527,
 *MALLARD DUCKS
 0260 " CHRONIC EFFECTS, BENTHOS, BACTERIA, ACUTE EFFECTS, GROWTH, OCS, TEXAS
 0261 " BERING SEA, PHYTOPLANKTON, TOXICITY
 0265 " CONTAMINATION, CHRONIC EFFECTS, BIOASSAY, MOLLUSKS, ESTUARIES, SEDIMENTS, *OYSTERS
 0267 " BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, ALGAE, FUEL OIL, TOXICITY,
 MICROORGANISMS, *DIATOMS
 0273 " BENTHOS, BACTERIA, ALGAE, FUEL OIL, WASTE OIL, TOXICITY, FRESHWATER, METABOLISM,
 *COMMUNITIES
 0277 " ARCTIC, FUEL OIL, MORTALITY, CRUSTACEANS, *AMPHIPODS
 0281 " SUBLETHAL EFFECTS, CRUSTACEANS, *BROWN SHRIMP, *ENZYMES
 0292 " CHRONIC EFFECTS, ECOSYSTEMS, SIMULATIONS, ESTUARIES, MOLLUSKS, CRUSTACEANS,
 *OYSTERS, *SHRIMP, *ENZYME ACTIVITIES
 0293 " CHRONIC EFFECTS, ECOSYSTEMS, SIMULATIONS, ESTUARIES, FISH, *STRIPED MULLET,
 *ENZYME ACTIVITIES
 0287 " MARSHES, PLANTS, GROWTH, SEDIMENTS, *SPARTINA ALTERNIFLORA
 0289 " CONCENTRATIONS, BIOLOGICAL EFFECTS, ALGAE, METABOLISM, TOXICITY
 0294 " BIRDS, ACUTE EFFECTS, REPRODUCTION, *FOOD INTAKE
 0295 " BIOLOGICAL EFFECTS, ARCTIC, PHYTOPLANKTON, ZOOPLANKTON, *TUNDRA PONDS
 0300 " BIOLOGICAL EFFECTS, BACTERIA, FISH, *MULLET, *FIN EROSION, *BACTERIOLOGICAL ASPECTS
 0301 " BIRDS, GROWTH, TOXICITY
 0307 " BACTERIA, PETROLEUM PRODUCTS, UPTAKE, TOXICITY, MICROORGANISMS
 0309 " BIRDS, TOXICITY, GROWTH, DEVELOPMENT, *MALLARD DUCKS, *NICKEL, *VANADIUM
 0311 " BIRDS, BIOLOGICAL EFFECTS, MORTALITY, *MALLARD DUCKS, *COLD AND SEAWATER STRESS
 0317 " AROMATIC HYDROCARBONS, PHYTOPLANKTON, TOXICITY, METABOLISM
 0319 " ACUTE EFFECTS, HYDROCARBONS, PHYTOPLANKTON, *PHOTOSYNTHESIS, *RESPIRATION
 0321 " BIOLOGICAL EFFECTS, BACTERIA, *CLOSED SYSTEMS, *BACTERIAL SUCCESSIONS
 0322 " CONTAMINATION, CASPIAN SEA, TOXICITY, MOLLUSKS, USSR, FILTRATION, GROWTH
 0338 " BIOLOGICAL EFFECTS, GROWTH, DEVELOPMENT, MOLLUSKS, *MYTILUS EDULIS
 0339 " AMOCO CADIZ SPILL, TOXICITY, MARINE ORGANISMS
 0340 " CONCENTRATIONS, HYDROCARBONS, FISH, GROWTH, DEVELOPMENT, *EMBRYOS, *JAPANESE
 MEDAKA
 0347 " ACUTE EFFECTS, DISPERSANTS, FISH, *SALMO GAIARDNERI, *STERN GLUCOSE AND SODIUM,
 *GILL MORPHOLOGY
 0355 " BIOMASS, ARCTIC, ALGAE, METABOLISM, PLANKTON, LAKES
 0361 " CHRONIC EFFECTS, FUEL OIL, TOXICITY, MORTALITY, MOLLUSKS, DELAWARE, ESTUARIES,
 *CRASSOSTREA VIRGINICA
 0362 " CONCENTRATIONS, AROMATIC HYDROCARBONS, UPTAKE, DEPURATION, FISH, *ORGANIC SULFUR
 COMPOUNDS
 0368 " CANADA, ARCTIC, INVERTEBRATES, MARINE ORGANISMS
 0369 " BIOLOGICAL EFFECTS, ARCTIC, MARINE ORGANISMS
 0373 " BIOLOGICAL EFFECTS, REPRODUCTION, *CORALS, *STYLOPHORA PISTILLATA
 0378 " BIOLOGICAL EFFECTS, ARCTIC, SOIL, MICROORGANISMS, *DENITRIFICATION, *NITROGEN
 FIXATION
 0392 " CONCENTRATIONS, WSP, DEVELOPMENT, GROWTH, FISH, *PACIFIC HERRING, *EMBRYOS
 0384 " UPTAKE, DEPURATION, PAH, FISH, *COALFISH, *PHENANTHRENE
 0395 " BIOLOGICAL EFFECTS, BACTERIA, ALASKA, FUNGI, SOIL, *HOT OIL, *TAIGA SOIL
 0387 " CONTAMINATION, NORWAY, REPRODUCTION, *GASTROPODS, *LITTORINA LITTOREA
 0389 " SUBLETHAL EFFECTS, DISPERSION, UPTAKE, MOLLUSKS, *MACOMA BALTHICA
 0396 " ALGAE, PETROLEUM PRODUCTS, MUTAGENS, TOXICITY, *CELANYDOMONAS PEINARDTII
 0399 " BIOLOGICAL EFFECTS, WSP, UPTAKE, METABOLISM, FOOD WEB, *RETENTION
 0402 " HYDROCARBONS, OIL-WATER SEPARATION, *CHARGE-TRANSFER
 0408 " CONTAMINATION, BEACHES, ADSORPTION, DISPERSANTS, SEDIMENTS
 0415 " BEACHES, INTERTIDAL ZONE, DISTRIBUTION, SEDIMENTATION, SPAIN, URQUIOLA SPILL
 0438 " BIODEGRADATION, BEAUFORT SEA, BASELINE STUDIES, ALASKA, MICROORGANISMS,
 SEDIMENTS, OCS
 0463 " CANADA, BIOLOGICAL EFFECTS, BIODEGRADATION, BEAUFORT SEA, BASELINE STUDIES,
 ARCTIC, MICROORGANISMS
 0480 " COASTS, BIRDS, BIOLOGICAL EFFECTS, BEHAVIOR, BEACHES, MARINE ENVIRONMENT, PAT,
 FISH, MARINE ORGANISMS, HEALTH HAZARDS
 0504 " ATLANTIC OCEAN, NATURAL SEEPAGE, NOAA
 0516 " BIODEGRADATION, ARCTIC, MICROORGANISMS, *TUNDRA PONDS, *PHOSPHATE FERTILIZER
 ADDITION
 0517 " CANADA, BIODEGRADATION, ARCTIC, PLANTS, MARINE ORGANISMS
 0519 " BIODEGRADATION, ARCTIC, MICROORGANISMS, RIVERS, FRESHWATER, *MUTAGENIC ACTIVITY
 0526 " BIODEGRADATION, BACTERIA, TAR SANDS, SEAWATER, HYDROCARBONS, EQUIPMENT, PHYSICAL
 EFFECTS, *TEMPERATURE
 0529 " CONTAMINATION, BIODEGRADATION, ALASKA, LAND FARMING, PLANTS, SOIL, FATE
 0530 " CHEMICAL ANALYSIS, BIODEGRADATION, BACTERIA, HYDROCARBONS, SOIL
 0536 " BIOLOGICAL EFFECTS, BIODEGRADATION, ARCTIC, MICROORGANISMS, SOIL, FATE, *TUNDRA
 0538 " CHEMICAL ANALYSIS, BIODEGRADATION, BACTERIA, *CALM ISOTOPES
 0546 " EMULSIONS, PAT, PHYSICAL EFFECTS, *EMULSION-SOLID INTERACTION
 0553 " BEHAVIOR, ICE, MOVEMENT, OIL SLICKS, *CURRENTS, *OIL-UNDER-ICE

0575 CRUDE OIL, OIL SLICKS, WEATHERING, FATE, EKOFISK BLOWOUT, NORTH SEA
 0580 " BEHAVIOR, FATE, OIL DISCHARGES, OFFSHORE, PRODUCTION, OIL FIELDS, NORTH SEA
 0581 " BLOWOUTS, BEHAVIOR, FATE, OIL DISCHARGES, EKOFISK BLOWOUT, NORTH SEA, OFFSHORE
 0594 " CHEMICAL ANALYSIS, BIODEGRADATION, WEATHERING, *COMPOSITION
 0599 " CARCINOGENS, BIOASSAY, AROMATIC HYDROCARBONS, OIL SHALE, FOSSIL FUELS, HEALTH HAZARDS, *PNA
 0600 " CARCINOGENS, PETROLEUM PRODUCTS, TAR, OIL SHALE, HEALTH HAZARDS, USSR, *BENZO(A)PYRENE, *ESTONIA
 0603 " MUTAGENS, HEALTH HAZARDS, PAH, WASTEWATERS, OIL SHALE, EXTRACTION
 0607 " CARCINOGENS, MUTAGENS, PAH, OIL SHALE, OIL INDUSTRY
 0635 " COST ANALYSIS, ENVIRONMENTAL EFFECTS, OIL INDUSTRY, FISHERIES, FISH, MARINE ORGANISMS, SOCIOECONOMIC EFFECTS
 0688 " STORAGE, SWEDEN, POLLUTION PREVENTION, *UNDERGROUND CAVERNS
 0720 " CRANKCASE OIL, BIOLOGICAL EFFECTS, WASTE OIL, DISPOSAL, LAND FARMING, FUEL OIL, MONITORING, PLANTS, SOIL
 0027 CRUSTACEANS, HYDROCARBONS, DETECTION, UPTAKE, *NAPHTHALENE, *CALLINectes SAPIDUS
 0255 " CRUDE OIL, BIOLOGICAL EFFECTS, TOXICITY, *LOBSTERS
 0277 " CRUDE OIL, ARCTIC, FUEL OIL, MORTALITY, *AMPHIPODS
 0281 " CRUDE OIL, SUBLETHAL EFFECTS, *BROWN SHRIMP, *ENZYMES
 0292 " CRUDE OIL, CHRONIC EFFECTS, ECOSYSTEMS, SIMULATIONS, ESTUARIES, MOLLUSKS, *OYSTERS, *SHRIMP, *ENZYME ACTIVITIES
 0284 " DISPERSANTS, TOXICITY, GROWTH, FISH, *MILKFISH, *GRASS SHRIMP
 0290 " BIOLOGICAL EFFECTS, *SP, TOXICITY, MORTALITY
 0291 " CONTAMINATION, CARCINOGENS, PAH, UPTAKE, FISH, MOLLUSKS, *COMMERCIAL SEAFOODS, *CREOSOTE
 0304 " WASTEWATERS, REFINERIES, TOXICITY, FUEL OIL, *GRASS SHRIMP
 0334 " PAH, TOXICITY, MORTALITY, DEVELOPMENT, *MUD CRABS, *NAPHTHALENE, *PHENANTHRENE, *SALINITY AND TEMPERATURE EFFECTS
 0335 " CONCENTRATIONS, CHRONIC EFFECTS, *SP, FUEL OIL, TOXICITY, *MUD CRABS
 0336 " BIOINDICATORS, ANNELIDS, HYDROCARBONS, UPTAKE, METABOLISM, MARINE ORGANISMS, MOLLUSKS, *DETOXIFICATION MECHANISMS
 0354 " CONTAMINATION, AMOCO CADIZ SPILL, FISHERIES, MOLLUSKS, FISH, FRANCE
 0360 " BIOLOGICAL EFFECTS, PORTS, PETROCHEMICALS, MEDITERRANEAN SEA, *BARNACLES
 0366 " AROMATIC HYDROCARBONS, METABOLISM, INVERTEBRATES, FISH, MOLLUSKS
 0392 " BEHAVIOR, FUEL OIL, TOXICITY, *LINOLUS POLYRHENUS, *MOLTING
 0500 " BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, *CRAYFISH, *PHYSIOLOGICAL EFFECTS, *NAPHTHALENE
 0604 " CONCENTRATIONS, PLATFORMS, UPTAKE, DEPURATION, HYDROCARBONS, GULF OF MEXICO, *BARNACLES, *ALKANES
 0130 DELAWARE, CONTAMINATION, SOURCE IDENTIFICATION, ESTUARIES, INDUSTRIES
 0361 " CRUDE OIL, CHRONIC EFFECTS, FUEL OIL, TOXICITY, MORTALITY, MOLLUSKS, ESTUARIES, *CRASSOSTREA VIRGINICA
 0511 " ATLANTIC COAST, ENVIRONMENTAL EFFECTS, OIL SPILLS, *SEA GRANT RESEARCH
 0372 DENMARK, BIOLOGICAL EFFECTS, MARINE ENVIRONMENT, LEGISLATION
 0736 " WASTE OIL, REGULATIONS, LEGISLATION, RECYCLING, REUSE, GERMANY, FRANCE, UK, ITALY, US
 0051 DEPURATION, CRUDE OIL, CHRONIC EFFECTS, CHROMATOGRAPHY, BENTHOS, ANALYTICAL TECHNIQUES, HYDROCARBONS, INVERTEBRATES, GC/MS
 0295 " AROMATIC HYDROCARBONS, ANIMALS, UPTAKE, METABOLISM, *RATS
 0316 " AQUATIC ENVIRONMENT, PAH, MARINE ORGANISMS, MOLLUSKS, UPTAKE, DISTRIBUTION
 0328 " AROMATIC HYDROCARBONS, UPTAKE, METABOLISM, FISH, *PACIFIC HERRING, *BENZENE, *TOLUENE
 0353 " CHRONIC EFFECTS, ACUTE EFFECTS, UPTAKE, FISH, PAH, *ACCUMULATION, *RAINBOW TROUT, *NAPHTHALENE
 0362 " CRUDE OIL, CONCENTRATIONS, AROMATIC HYDROCARBONS, UPTAKE, FISH, *ORGANIC SULFUR COMPOUNDS
 0384 " CRUDE OIL, UPTAKE, PAH, FISH, *COALFISH, *PHENANTHRENE
 0390 " BIRDS, ANALYTICAL TECHNIQUES, TOXICITY, HYDROCARBONS, GROWTH, DEVELOPMENT, UPTAKE, *RESEARCH REVIEW
 0447 " CHRONIC EFFECTS, BASELINE STUDIES, ALASKA, ACUTE EFFECTS, TOXICITY, UPTAKE, METABOLISM, ORGANISMS, HYDROCARBONS
 0604 " CRUSTACEANS, CONCENTRATIONS, PLATFORMS, UPTAKE, HYDROCARBONS, GULF OF MEXICO, *BARNACLES, *ALKANES
 0022 DESIGN-ENGINEERING, OIL SLICKS, EQUIPMENT, PATENT
 0026 " MOVEMENT, DETECTION, MONITORING, ICE, REMOTE SENSING, PERFORMANCE TESTING
 0028 " OIL SLICKS, DETECTION, EQUIPMENT, PATENT
 0046 " REMOTE SENSING, USCG, SURVEILLANCE, EQUIPMENT, *AOSS II
 0131 " BOOMS, SPILL CONTAINMENT, EQUIPMENT, PATENT
 0132 " SPILL CONTAINMENT, EQUIPMENT, PERFORMANCE TESTING, RIVERS, *AIR BUBBLE DIVERTER
 0133 " BOOMS, SPILL CONTAINMENT, PERFORMANCE TESTING, *AIR JET BOOM
 0134 " BOOMS, SPILL CONTAINMENT, PERFORMANCE TESTING, UK
 0137 " BOOMS, SPILL CONTAINMENT, EQUIPMENT, SPILL REMOVAL, PATENT
 0154 " ADSORPTION, SPILL CLEANUP, PERFORMANCE TESTING, EQUIPMENT
 0158 " SPILL CLEANUP, SKINNERS, EQUIPMENT, PATENT
 0167 " SPILL REMOVAL, OIL-WATER SEPARATION, PRODUCT INFORMATION

0160 DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, SPILL CLEANUP, SKIMMERS, EQUIPMENT, PERFORMANCE TESTING, UK

0179 " COLD CLIMATES, CANADA, ARCTIC, SPILL CLEANUP, SKIMMERS, PERFORMANCE TESTING, *AMOP

0181 " SPILL CONTAINMENT, SPILL REMOVAL, EQUIPMENT, PATENT

0182 " SPILL CLEANUP, INCINERATION, PETROCHEMICALS, SLUDGE, *DETOXIFICATION, *RESIDUAL OILS

3195 " SPILL CLEANUP, SKIMMERS, EQUIPMENT, PERFORMANCE TESTING, *WRINGER

0186 " BEACH CLEANUP, SPILL DISPOSAL, TAB, INCINERATION, EQUIPMENT

0242 " PERFORMANCE TESTING, EQUIPMENT, SPILL CLEANUP, EPA, *OHMSETT TEST FACILITY

0556 " ANALYTICAL TECHNIQUES, DETECTION, INFORMATION SYSTEMS

0670 " TANKERS, SEGREGATED BALLAST, POLLUTION PREVENTION, OIL DISCHARGES, SAFETY

0009 DETECTION, COASTS, CANADA, SOURCE IDENTIFICATION, PAH, SEDIMENTS, *SHELLFISH, *CEPHALOPODS, *WHARF STRUCTURES

0019 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, PAH

0020 " CONCENTRATIONS, CANADA, ARCTIC, HYDROCARBONS, SEAWATER, SEDIMENTS, *BAFFIN BAY

0023 " CONCENTRATIONS, AMOCO CADIZ SPILL, SPECTROMETRY, WSP, SEAWATER, ENGLISH CHANNEL

0024 " CHEMICAL ANALYSIS, ANIMALS, PAH

0026 " DESIGN-ENGINEERING, MOVEMENT, MONITORING, ICE, REMOTE SENSING, PERFORMANCE TESTING

0027 " CEPHALOPODS, HYDROCARBONS, UPTAKE, *NAPHTHALENE, *CALLINECTES RAPIDUS

0028 " DESIGN-ENGINEERING, OIL SLICKS, EQUIPMENT, PATENT

0029 " CHEMICAL ANALYSIS, BIOINDICATORS, BIOASSAY, SAMPLING, WATER QUALITY

0033 " REMOTE SENSING, OIL SPILLS, MONITORING

0039 " REMOTE SENSING, FRANCE, SHORELINES

0042 " REMOTE SENSING, DRIFT, MOVEMENT, MONITORING

0043 " REMOTE SENSING, PERFORMANCE TESTING, EQUIPMENT, MONITORING, OIL SPILLS, *SCATTEROMETER, *RADAR

0044 " BIBLIOGRAPHIES, REMOTE SENSING, MONITORING, POLLUTION CONTROL, ESTUARIES

0045 " COASTAL WATERS, CANADA, ARCTIC, REMOTE SENSING, NATURAL SEEPAGE

0047 " CONTAMINATION, REMOTE SENSING, DISTRIBUTION, JAPAN, *STRAITS OF TSUBUSHIMA

0049 " REMOTE SENSING, SIMULATIONS, *ALGORITHMS

0067 " CONCENTRATIONS, CHEMICAL ANALYSIS, PAH, MOLLUSKS, *MUSSELS

0068 " SAMPLING, SOURCES, MARINE ENVIRONMENT, HYDROCARBONS, *ATMOSPHERIC INPUTS

0071 " CONCENTRATIONS, EXPLORATION, NORTH SEA, HYDROCARBONS, SEAWATER, SAMPLING

0076 " CHEMICAL ANALYSIS, HYDROCARBONS, SEDIMENTS, *INTERLABORATORY COMPARISON

0095 " CHEMICAL ANALYSIS, PETROLEUM PRODUCTS, EQUIPMENT, *FIELD DEPLOYABLE INSTRUMENT

0104 " CONTAMINATION, CHEMICAL ANALYSIS, SAMPLING, SOURCE IDENTIFICATION, OIL SPILLS

0109 " BIOGENIC HYDROCARBONS, AROMATIC HYDROCARBONS, ANIMALS, ANALYTICAL TECHNIQUES, SAMPLING, ZOOPLANKTON

0111 " ANALYTICAL TECHNIQUES, PAH, MARINE ORGANISMS, SEDIMENTS, SEAWATER

0128 " BIOGENIC HYDROCARBONS, SOURCE IDENTIFICATION, HYDROCARBONS, MARINE ORGANISMS

0447 " CONTAMINATION, GROUNDWATER, EXPLORATION, DEVELOPMENT, MONITORING, UK, *CONFERENCE

3556 " DESIGN-ENGINEERING, ANALYTICAL TECHNIQUES, INFORMATION SYSTEMS

0617 " WASTEWATERS, HYDROCARBONS, *IONIZATION

0740 " CHEMICAL ANALYSIS, PHYSICAL ASPECTS, HYDROCARBONS, *INTERCALIBRATION WORKSHOP

0292 DEVELOPMENT, CONTAMINATION, CHRONIC EFFECTS, BIRDS, METABOLISM, *WSPs, *PATRICK WILDLIFE RESEARCH CENTER

0309 " CRUDE OIL, BIRDS, TOXICITY, GROWTH, *MALLARD DUCKS, *WICKEL, *VANADIA

0323 " BIOLOGICAL EFFECTS, PETROLEUM PRODUCTS, METABOLISM, *PORPHYRA

0334 " CEPHALOPODS, PAH, TOXICITY, MORTALITY, *MUD CRABS, *NAPHTHALENE, *PHENANTHRENE, *SALINITY AND TEMPERATURE EFFECTS

0338 " CRUDE OIL, BIOLOGICAL EFFECTS, GROWTH, MOLLUSKS, *MYTILUS EDULIS

0340 " CRUDE OIL, CONCENTRATIONS, HYDROCARBONS, FISH, GROWTH, *EMBRYOS, *JAPANESE MEDAKA

0379 " WSP, HYDROCARBONS, FISH, MORTALITY, GROWTH, *PUNDULUS HETEROCLOTUS

0382 " CRUDE OIL, CONCENTRATIONS, WSP, GROWTH, FISH, *PACIFIC HERPING, *EMBRYOS

0390 " DEGRADATION, BIRDS, ANALYTICAL TECHNIQUES, TOXICITY, HYDROCARBONS, GROWTH, UPTAKE, *RESEARCH REVIEW

0439 " BASELINE STUDIES, ENVIRONMENTAL EFFECTS, PACIFIC COAST, ECOSYSTEMS, PREDICTIONS

0448 " BASELINE STUDIES, MONITORING, ENVIRONMENTAL EFFECTS, OIL SHALE, *COLORADO

0449 " COASTS, BEAUFORT SEA, BASELINE STUDIES, ALASKA, FISHERIES, WILDLIFE, OFFSHORE

0450 " CONTAMINATION, BASELINE STUDIES, ALASKA, OCS, ENVIRONMENTAL EFFECTS

0457 " COMPENSATION, LIABILITY, OFFSHORE, ONSHORE, SOURCES, RIVERS, POLLUTION CONTROL, UK, *WSP CONVENTION

0487 " DETECTION, CONTAMINATION, GROUNDWATER, EXPLORATION, MONITORING, UK, *CONFERENCE

0488 " FISHERIES, MARINE ENVIRONMENT, OFFSHORE, OCS, NEW YORK

0611 " CANADA, BIOLOGICAL EFFECTS, ONSHORE, FISH, WILDLIFE, *ALBERTA

0624 " ATLANTIC COAST, FISHERIES, RESOURCE MANAGEMENT, OCS, GEORGES BANK, DRILLING, HABITATS

0626 " LEGISLATION, OCS, OFFSHORE, ENVIRONMENTAL EFFECTS, GUIDELINES, POLLUTION CONTROL

0639 " BLOWOUTS, OFFSHORE, OIL INDUSTRY, PRODUCTION, PLATFORMS, SPILL RESPONSE, SPILL CLEANUP, SAFETY

0639 " BASELINE STUDIES, ENVIRONMENTAL EFFECTS, OIL SHALE, PRODUCTION, MONITORING, *PROCEEDINGS

0640 " COASTAL WATERS, ENVIRONMENTAL EFFECTS, UK, MARINE ENVIRONMENT, SHIPS, OFFSHORE, *PROCEEDINGS

0643 DEVELOPMENT, COASTS, ALASKA , OCS, OIL DISCHARGES, ESTUARIES, OFFSHORE, OREGON,
 WASHINGTON, PACIFIC COAST
 0648 " OIL-GAS LEASING, OFFSHORE, OCS, PRODUCTION, ENVIRONMENTAL EFFECTS, FISHERIES,
 RESOURCE MANAGEMENT, SANTA BARBARA CHANNEL
 0651 " COASTAL WATERS, OFFSHORE, EXPLORATION, ECOSYSTEMS, RESOURCE MANAGEMENT, ECONOMICS,
 LOUISIANA
 0657 " EPA, ENVIRONMENTAL EFFECTS, OIL SHALE, POLLUTION PREVENTION, POLLUTION CONTROL,
 REGULATIONS, *ENFORCEMENT
 0659 " ATLANTIC COAST, OCS, FISHERIES, RISK ANALYSIS
 0695 " SHIPS, TANKERS, OCS, PRODUCTION, OIL TRANSPORT, PORTS , SANTA BARBARA CHANNEL,
 PACIFIC COAST
 0745 " ATLANTIC COAST, ALASKA , OFFSHORE, OCS, SAFETY, RISK ANALYSIS, PACIFIC COAST, US,
 *ENVIRONMENTAL HAZARDS
 0058 DISPERSANTS, CONCENTRATIONS, CHEMICAL ANALYSIS, HYDROCARBONS , DISPERSION
 0150 " CANADA, BEAUFORT SEA, ARCTIC, SPILL REMOVAL
 0153 " SPILL CLEANUP, SPILL RESPONSE, MANUALS, GUIDELINES
 0155 " SPILL REMOVAL, GUIDELINES
 0156 " SPILL CLEANUP, SPILL REMOVAL, PERFORMANCE TESTING, *FEASIBILITY STUDIES, *APPLIC
 APPLICATION,
 0157 " BIOLOGICAL EFFECTS, BIOASSAY, BEACH CLEANUP, TOXICITY, INTERTIDAL ZONE,
 PERFORMANCE TESTING
 0162 " SPILL CLEANUP, MANUALS, GUIDELINES, SPILL RESPONSE
 0171 " CONTINGENCY PLANNING, AMOCO CADIZ SPILL, SPILL CLEANUP, SPILL RESPONSE, EQUIPMENT
 0172 " BIODEGRADATION, SPILL REMOVAL, MICROORGANISMS, PATENT
 0174 " SPILL CLEANUP, *RESIDUAL OILS
 0176 " TOXICITY, SURFACTANTS, SPILL REMOVAL, TANKERS, POLLUTION CONTROL
 0180 " SPILL CLEANUP, REGULATIONS, PERSONNEL TRAINING, SPILL COOPERATIVES
 0190 " CALIFORNIA, PERSONNEL TRAINING, PERFORMANCE TESTING, EQUIPMENT, SPILL CLEANUP, OIL
 INDUSTRY, USCG
 0204 " SPILL RESPONSE, POLLUTION CONTROL
 0209 " SPILL RESPONSE, GOVERNMENT AGENCIES, REGULATIONS, *APPLICATION PROCEDURES
 0223 " CONTINGENCY PLANNING, INTERNATIONAL CONVENTIONS, OIL SPILLS, INCO, *MALTA CENTRE
 0229 " POLLUTION PREVENTION, SPILL CONTAINMENT, SPILL CLEANUP, GOVERNMENT AGENCIES, UK
 0248 " SPILL RESPONSE, SPILL CLEANUP
 0257 " BIRDS, BIOLOGICAL EFFECTS, *HALLARD EMBRYOS, *HATCHABILITY
 0259 " CRUDE OIL, BIRDS, BIOLOGICAL EFFECTS, TOXICITY, WILDLIFE, *COREXIT 9527, *HALLARD
 DUCKS
 0284 " CRUSTACEANS, TOXICITY, GROWTH, FISH, *MILKFISH, *GRASS SHRIMP
 0347 " CRUDE OIL, ACUTE EFFECTS, FISH, *SALMO GARDNERI, *SERUM GLUCOSE AND SODIUM, *GILL
 MORPHOLOGY
 0348 " BIOLOGICAL EFFECTS, FUEL OIL, UPTAKE, FISH
 0351 " BIOLOGICAL EFFECTS, BACTERIA, MICROORGANISMS, STATISTICAL ANALYSIS, PRODUCT
 INFORMATION
 0394 " TOXICITY, PETROLEUM PRODUCTS, PHYTOPLANKTON, GROWTH, *DIATOMS, *EMULSIFIERS
 0403 " CRUDE OIL, CONTAMINATION, BEACHES, ADSORPTION, SEDIMENTS
 0471 " ENVIRONMENTAL EFFECTS, HEALTH HAZARDS, SOCIOECONOMIC EFFECTS, *PENNA AR BED JOURNAL
 0561 " BEHAVIOR, PHYSICAL ASPECTS, DISPERSION
 0567 " COASTAL WATERS, ARCTIC, ENVIRONMENTAL EFFECTS, SHORELINES, *EXPERIMENTAL SPILLS
 0673 " CARIBBEAN SEA, SPILL RESPONSE, OIL INDUSTRY, TANKERS, *AEGEAN CAPTAIN SPILL,
 *ATLANTIC EMPRESS SPILL
 0680 " BIRDS, OIL TRANSFER, LEAKAGE, OIL SHALE, MORTALITY
 0058 DISPERSION, DISPERSANTS, CONCENTRATIONS, CHEMICAL ANALYSIS, HYDROCARBONS
 0107 " AQUATIC ENVIRONMENT, SAMPLING, PAH, SCUMS, SEDIMENTS, LAKES
 0198 " POLLUTION CONTROL, SPILL CLEANUP, SKIMMERS, TANKERS, *OIL STRANDING
 0389 " CRUDE OIL, SUBLETHAL EFFECTS, UPTAKE, MOLLUSKS, *MACOMA BALTHICA
 0403 " DISTRIBUTION, HYDROCARBONS , TOXICITY, PHYSICAL ASPECTS
 0404 " BEACHES, PHYSICAL EFFECTS, INTERTIDAL ZONE, WEATHERING, *MECHANICAL DISPERSAL
 0416 " CHEMICAL EFFECTS, PHYSICAL ASPECTS, EMULSIONS
 0557 " GROUNDWATER, SOURCE IDENTIFICATION, HYDROCARBONS
 0561 " DISPERSANTS, BEHAVIOR, PHYSICAL ASPECTS
 0578 " HYDROCARBONS , FATE, SEAWATER, SEDIMENTS, MARINE ENVIRONMENT
 0589 " BIODEGRADATION, OIL SPILLS, SEA SURFACE, WEATHERING, FATE, SEDIMENTATION,
 MICROORGANISMS
 0742 " CONCENTRATIONS, SAMPLING, SOLUBILITY, HYDROCARBONS , SEAWATER, *WISKIN VS. BLUMPP
 SAMPLERS
 0233 DISPOSAL , CONTAMINATION, OIL SPILLS, GROUNDWATER, POLLUTION PREVENTION, OIL REMOVAL,
 RECOVERY, RESTORATION
 0502 " CONTAMINATION, INDUSTRIES, LEAKAGE, OIL DISCHARGES, GROUNDWATER, WASTEWATERS
 0520 " BIODEGRADATION, SLUDGE , SOIL, STORAGE, REFINERIES, LAND FARMING
 0652 " CANADA, WASTEWATERS, ENVIRONMENTAL EFFECTS, ONSHORE IMPACTS, *DRILLING MUDS,
 *ALBERTA
 0658 " WASTEWATERS, OIL FIELDS, OIL WELLS, ONSHORE, OIL INDUSTRY, ENVIRONMENTAL EFFECTS,
 GROUNDWATER, WILDLIFE, LAKES , *FLAYAS
 0698 " REFINERIES, EUROPE, MARINE ENVIRONMENT, TOXICITY, WASTEWATER TREATMENT
 0699 " WASTE OIL, LAND FARMING, EMULSIONS, SOIL, TOXICITY, PLANTS

0712 DISPOSAL , WASTEWATERS, WASTE OIL, INDUSTRIES, LAND FARMING
 0717 " BIODEGRADATION, WASTEWATERS, WASTE OIL, LAND FARMING, RECLAMATION, FUEL OIL
 0718 " LAND FARMING, PLANTS, SOIL, WASTE OIL
 0720 " CRUDE OIL, CRANKCASE OIL, BIOLOGICAL EFFECTS, WASTE OIL, LAND FARMING, FUEL OIL,
 MONITORING, PLANTS, SOIL
 0721 " BOOK REVIEW, WASTEWATERS, WASTE OIL, LAND FARMING, INDUSTRIES
 0724 " WASTE OIL, LAND FARMING, SOIL, *LEACHING TEST
 0731 " WASTE OIL, RECYCLING, REFINING, REUSE, LAND FARMING, FUEL OIL, *COMBUSTION
 0733 " CRANKCASE OIL, REFINING, WASTE OIL, RECLAMATION, RECYCLING
 0734 " WASTE OIL, RECLAMATION, REFINING, REUSE, GOVERNMENT AGENCIES, LEGISLATION, *BUREAU
 OF MINES
 0735 " CALIFORNIA, WASTE OIL, RECYCLING, REGULATIONS, LEGISLATION, US, *MINNESOTA, *UTAH
 0031 DISTRIBUTION, HYDROCARBONS , PAH, ESTUARIES, GC/MS, SEDIMENTS, *DIATOMS
 0047 " DETECTION, CONTAMINATION, REMOTE SENSING, JAPAN, *STRAITS OF TSURUSHIMA
 0052 " CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES, FATE, HYDROCARBONS , SAMPLING
 0062 " CONTAMINATION, CONCENTRATIONS, SAMPLING, FRESHWATER, FISH, SEDIMENTS, VEGETATION,
 *TETRAALKYLLEAD COMPOUNDS
 0065 " CONCENTRATIONS, AFRICA, MONITORING, TAR, SAMPLING
 0075 " BIODEGRADATION, BACTERIA, HYDROCARBONS , PACIFIC OCEAN, *SOUTH CHINA SEA
 0077 " CONCENTRATIONS, HYDROCARBONS , SEDIMENTS, SAMPLING
 0084 " CONCENTRATIONS, PAH, SEDIMENTS, SOURCES, *COMBUSTION, *URBAN CENTERS
 0094 " CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, SEDIMENTS, GC/MS, SOURCES
 0106 " SAMPLING, SEDIMENTS, LAKES , *SWITZERLAND, *AZAARENES
 0127 " SOURCE IDENTIFICATION, PAH, SEDIMENTS, *ESTUARIES, *NARRAGANSETT BAY
 0312 " COASTAL WATERS, BENTHOS, AMOCO CADIZ SPILL, MORTALITY, SUBLETHAL EFFECTS, MARINE
 ORGANISMS, FRANCE
 0314 " BIOLOGICAL EFFECTS, HYDROCARBONS , SAMPLING, PHYTOPLANKTON, GROWTH
 J316 " DEPURATION, AQUATIC ENVIRONMENT, PAH, MARINE ORGANISMS, MOLLUSKS, *TANKS
 0386 " BIOLOGICAL EFFECTS, BENTHOS, NATURAL SEEPAGE, MARINE ORGANISMS, MICROORGANISMS,
 SANTA BARBARA CHANNEL
 0403 " DISPERSION, HYDROCARBONS , TOXICITY, PHYSICAL ASPECTS
 0406 " COASTS, AMOCO CADIZ SPILL, PHYSICAL EFFECTS, SHORELINES, SEDIMENTATION, INTERTIDAL
 ZONE, FRANCE
 0410 " BEHAVIOR, EKOFISK BLOWOUT, NORTH SEA, OIL SLICKS, FATE
 0415 " CRUDE OIL, BEACHES, INTERTIDAL ZONE, SEDIMENTATION, SPAIN, URQUIOLA SPILL
 0431 " CANADA, SEAFORT SEA, BASELINE STUDIES, BACTERIA, ARCTIC
 0583 " CONCENTRATIONS, NATURAL SEEPAGE, HYDROCARBONS , MOLLUSKS, ENVIRONMENTAL EFFECTS,
 GULF OF MEXICO
 0749 " COASTAL WATERS, CALIFORNIA, MARINE ORGANISMS, PLATFORMS, OFFSHORE, HABITATS
 0656 DOZ, BAYS, REFINERIES, USCG, SPILL RESPONSE, VIRGINIA
 0011 DRIFT, MONITORING, EQUIPMENT, MOVEMENT, ICE, *TRACKING BUOYS
 0012 " MONITORING, EQUIPMENT, MOVEMENT, ICE, *TRACKING BUOYS
 0042 " DETECTION, REMOTE SENSING, MOVEMENT, MONITORING
 0547 " BEHAVIOR, MOVEMENT, PHYSICAL ASPECTS, OIL SLICKS, *WAVE AND WIND ACTION
 0548 " BEHAVIOR, OIL SLICKS, PHYSICAL EFFECTS
 0549 " BEHAVIOR, OIL SLICKS, SPREADING, SEA SURFACE
 0550 " BEHAVIOR, EKOFISK BLOWOUT, NORTH SEA, PHYSICAL ASPECTS
 0559 " BEHAVIOR, MOVEMENT, OIL SLICKS, GULF OF MEXICO, IXTOC 1 BLOWOUT, ENVIRONMENTAL
 EFFECTS
 0563 " BEHAVIOR, PREDICTIONS, OIL SPILLS
 0196 DRILLING, CONTINGENCY PLANNING, CANADA, BLOWOUTS, ARCTIC, SPILL RESPONSE, OFFSHORE
 0443 " CANADA, BASELINE STUDIES, ENVIRONMENTAL EFFECTS, SPILL RESPONSE, MOVEMENT,
 PREDICTIONS, OCS, LABRADOR SEA, *TRAJECTORIES, *NEWFOUNDLAND
 0444 " CANADA, BLOWOUTS, BASELINE STUDIES, ENVIRONMENTAL EFFECTS, OCS, LABRADOR SEA,
 *NEWFOUNDLAND
 0609 " CORAL REEFS, OFFSHORE, PLATFORMS, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS,
 FISHERIES, *DRILLING MUDS
 0612 " BIOLOGICAL EFFECTS, BENTHOS, TOXICITY, OFFSHORE, ESTUARIES, MARINE ORGANISMS,
 *BIOCIDES
 0614 " CHEMICAL EFFECTS, CHEMICAL ANALYSIS, CANADA, ARCTIC, TOXICITY, OFFSHORE,
 EXPLORATION, WASTEWATER DISPOSAL, *DRILLING MUDS
 0620 " CANADA, ECONOMICS, SOCIOECONOMIC EFFECTS, OFFSHORE, EXPLORATION
 0624 " DEVELOPMENT, ATLANTIC COAST, FISHERIES, RESOURCE MANAGEMENT, OCS, GEORGES BANK,
 HABITATS
 0629 " OFFSHORE, IXTOC 1 BLOWOUT, GULF OF MEXICO
 0634 " COASTS, ENVIRONMENTAL EFFECTS, OIL SPILLS, ONSHORE IMPACTS, SOCIOECONOMIC EFFECTS
 0641 " FISHERIES, OIL INDUSTRY, PLATFORMS, OFFSHORE, EXPLORATION, NORWAY, NORTH SEA
 0642 " ENVIRONMENTAL EFFECTS, SURVEILLANCE, OIL WELLS, *ENHANCED OIL RECOVERY
 0644 " CANADA, OFFSHORE, SAFETY, ENVIRONMENTAL EFFECTS, PREDICTIONS, *LANCASTER SOUND
 0646 " ENVIRONMENTAL EFFECTS, FOSSIL FUELS, PIPELINES, STORAGE
 0647 " OFFSHORE, PRODUCTION, ENVIRONMENTAL EFFECTS, ESTUARIES, ECOSYSTEMS, LOUISIANA
 0654 " OFFSHORE, GEORGES BANK, OIL-GAS LEASING, FISHERIES, US GOVERNMENT
 0691 " TANKERS, SHIPS, OFFSHORE, OIL SPILLS, SOURCES, FRANCE, INFORMATION SYSTEMS, *DATA
 BANK, *ACCIDENTS
 0467 ECONOMIC EFFECTS, COASTAL WATERS, ENVIRONMENTAL EFFECTS, FISHERIES, FRANCE

0619 ECONOMIC EFFECTS, ATLANTIC COAST, OFFSHORE, EXPLORATION, PRODUCTION, GULF OF MEXICO, WATER QUALITY

0145 ECONOMICS, LEGISLATION, US GOVERNMENT, SPILL CLEANUP, OIL INDUSTRY

0249 " POLLUTION CONTROL, MARINE ENVIRONMENTS, LEGISLATION, INTERNATIONAL AGREEMENTS, *REVIEW

0395 " BIOINDICATORS, MOLLUSKS, FISHERIES, *LITTLENCK CLAMS

0620 " DRILLING, CANADA, SOCIOECONOMIC EFFECTS, OFFSHORE, EXPLORATION

0645 " FISHERIES, US, OFFSHORE, PRODUCTION, ENVIRONMENTAL EFFECTS

0651 " DEVELOPMENT, COASTAL WATERS, OFFSHORE, EXPLORATION, ECOSYSTEMS, RESOURCE MANAGEMENT, LOUISIANA

0697 " OIL TRANSPORT, OIL TRANSFER, TANKERS, PACIFIC OCEAN, PORTS, ENVIRONMENTAL EFFECTS, *MALACCA STRAITS, *PALAU

0710 " COST ANALYSIS, WASTEWATER TREATMENT, REFINERIES, *ACTIVATED CARBON

0719 " WASTE OIL TREATMENT, WASTEWATER TREATMENT, INDUSTRIES, *CAPABILITIES

0079 ECOSYSTEMS, CRUDE OIL, CONTAMINATION, BIODEGRADATION, BACTERIA, ARCTIC, SEAWATER, FRESHWATER, GASOLINE, STATISTICAL ANALYSIS

0245 " POLLUTION CONTROL, MARINE ORGANISMS, RED SEA, MONITORING, OIL INDUSTRY, WASTEWATERS, INTERNATIONAL AGREEMENTS, *ALESCO

0282 " CRUSTACEANS, CRUDE OIL, CHRONIC EFFECTS, SIMULATIONS, ESTUARIES, MOLLUSKS, *OYSTERS, *SHRIMP, *ENZYME ACTIVITIES

0283 " CRUDE OIL, CHRONIC EFFECTS, SIMULATIONS, ESTUARIES, FISH, *STRIPED MULLET, *ENZYME ACTIVITIES

0302 " CHRONIC EFFECTS, BENTHOS, FUEL OIL, *HEEL EXPERIMENTS

0313 " BIOLOGICAL EFFECTS, MARINE ORGANISMS, HYDROCARBONS, HABITATS

0330 " BIOLOGICAL EFFECTS, MARINE ORGANISMS, PETROLEUM PRODUCTS

0359 " BIOLOGICAL EFFECTS, ENVIRONMENTAL EFFECTS, WILDLIFE, EPA, *USFWS

0439 " DEVELOPMENT, BASELINE STUDIES, ENVIRONMENTAL EFFECTS, PACIFIC COAST, PREDICTIONS

0468 " ENVIRONMENTAL EFFECTS, OFFSHORE, PRODUCTION, OCS, PLATFORMS, HABITATS, TEXAS, *BUCCANEER OIL FIELD

0493 " COASTS, AMOCO CADIZ SPILL, ENVIRONMENTAL EFFECTS, MARINE ORGANISMS, SAMPLING, FRANCE, *SPECIAL ISSUE

0514 " CONTAMINATION, FATE, ENVIRONMENTAL EFFECTS, HYDROCARBONS, MARINE ORGANISMS, NOAA

0647 " DRILLING, OFFSHORE, PRODUCTION, ENVIRONMENTAL EFFECTS, ESTUARIES, LOUISIANA

0651 " ECONOMICS, DEVELOPMENT, COASTAL WATERS, OFFSHORE, EXPLORATION, RESOURCE MANAGEMENT, LOUISIANA

0625 FIS, OIL INDUSTRY, OFFSHORE, OCS, POLLUTION CONTROL, LEGISLATION, US

0071 EKOFISK BLOWOUT, DETECTION, CONCENTRATIONS, NORTH SEA, HYDROCARBONS, SEAWATER, SAMPLING

0271 " BIOLOGICAL EFFECTS, NORTH SEA, ZOOPLANKTON, FISH, *EGGS AND LARVAE

0315 " NORTH SEA, MICROORGANISMS

0331 " NORTH SEA, FISH

0332 " BIOLOGICAL EFFECTS, NORTH SEA, PLANKTON

0370 " NORTH SEA, PHYTOPLANKTON, PRODUCTION, *RESEARCH REVIEW

0410 " DISTRIBUTION, BEHAVIOR, NORTH SEA, OIL SLICKS, FATE

0459 " NORTH SEA, ENVIRONMENTAL EFFECTS, PLANKTON, FISH

0489 " NORTH SEA, ENVIRONMENTAL EFFECTS, OIL SLICKS

0492 " BEHAVIOR, NORTH SEA, ENVIRONMENTAL EFFECTS, FATE, *RESEARCH REVIEW

0494 " NORTH SEA, *RESEARCH REVIEW

0531 " BIODEGRADATION, BACTERIA, NORTH SEA, FUNGI

0550 " DRIFT, BEHAVIOR, NORTH SEA, PHYSICAL ASPECTS

0575 " CRUDE OIL, OIL SLICKS, WEATHERING, FATE, NORTH SEA

0581 " CRUDE OIL, BLOWOUTS, BEHAVIOR, FATE, OIL DISCHARGES, NORTH SEA, OFFSHORE

0586 " BEHAVIOR, NORTH SEA, FATE, OIL SLICKS, MOVEMENT

0623 " AMOCO CADIZ SPILL, INTERNATIONAL AGREEMENTS, REGULATIONS, OFFSHORE, PRODUCTION, NORTH SEA

0630 " NORTH SEA, GOVERNMENT AGENCIES, NORWAY

0544 EMULSIFICATION, OIL REMOVAL, OIL-WATER SEPARATION, PHYSICAL ASPECTS

0416 EMULSIONS, DISPERSION, CHEMICAL EFFECTS, PHYSICAL ASPECTS

0546 " CRUDE OIL, FATE, PHYSICAL EFFECTS, *EMULSION-SOLID INTERACTION

0699 " DISPOSAL, WASTE OIL, LAND FARMING, SOIL, TOXICITY, PLANTS

0716 " CONTAMINATION, ABSORPTION, WASTEWATER TREATMENT, OIL REMOVAL

0730 " ADSORPTION, OIL-WATER SEPARATION, WASTEWATERS, INDUSTRIES, EQUIPMENT, FLOTATION, FILTRATION

0023 ENGLISH CHANNEL, DETECTION, CONCENTRATIONS, AMOCO CADIZ SPILL, SPECTROMETRY, WSP, SEAWATER

0085 " ANALYTICAL TECHNIQUES, AMOCO CADIZ SPILL, SAMPLING, SEAWATER, SEDIMENTS, FRANCE

0318 " BIRDS, AMOCO CADIZ SPILL, MORTALITY, FRANCE

0025 ENVIRONMENTAL EFFECTS, COASTS, MONITORING, SHELF LINES, *ROCKY SEASHORES

0359 " ECOSYSTEMS, BIOLOGICAL EFFECTS, WILDLIFE, EPA, *USFWS

0404 " BENTHOS, AMOCO CADIZ SPILL, SEDIMENTATION, INTERTIDAL ZONE, *SEALED PENETRATION

0420 " ECONOMIC

0429 " BASELINE STUDIES, ALASKA, MICROORGANISMS, DEVELOPMENTS, OCS

0439 " ECOSYSTEMS, DEVELOPMENT, BASELINE STUDIES, PACIFIC COAST, PREDICTIONS

0443 " DRILLING, CANADA, BASELINE STUDIES, SPILL RESPONSE, MOVEMENT, PREDICTIONS, OCS, LABRADOR SEA, *TRAJECTORIES, *NEWFOUNDLAND

0444 ENVIRONMENTAL EFFECTS, DRILLING, CANADA, BLOWOUTS, BASELINE STUDIES, OCS, LABRADOR
SEA, *NEWFOUNDLAND

0445 " CANADA, BLOWOUTS, BASELINE STUDIES, OCS, LABRADOR SEA, *BIOLOGICAL DESCRIPTIONS

0448 " DEVELOPMENT, BASELINE STUDIES, MONITORING, OIL SHALE, *COLORADO

0450 " DEVELOPMENT, CONTAMINATION, BASELINE STUDIES, ALASKA, OCS

0459 " EKOFISK BLOWOUT, NORTH SEA, PLANKTON, FISH

0460 " IXTOC 1 BLOWOUT, OFFSHORE, GULF OF MEXICO, PERSONNEL TRAINING, REGULATIONS

0465 " CARIBBEAN SEA, OIL SPILLS, PUERTO RICO

0466 " BIOINDICATORS, MONITORING, MARINE ENVIRONMENT, OIL DISCHARGES, INDUSTRIES, UN

0467 " ECONOMIC EFFECTS, COASTAL WATERS, FISHERIES, FRANCE

0468 " ECOSYSTEMS, OFFSHORE, PRODUCTION, OCS, PLATFORMS, HABITATS, TEXAS, *BUCCANEER OIL
FIELD

0469 " CARCINOGENS, TOXICITY, PAN

0471 " DISPERSANTS, HEALTH HAZARDS, SOCIOECONOMIC EFFECTS, *PENN AR BED JOURNAL

0475 " COASTS, AMOCO CADIZ SPILL, SHORELINES, FRANCE, STATISTICS

0478 " COASTAL WATERS, AMOCO CADIZ SPILL, FRANCE

0481 " CHEMICAL ANALYSIS, FATE, GUIDELINES, HYDROCARBONS, MARINE ENVIRONMENT

0483 " CHRONIC EFFECTS, BOOK REVIEW, AMOCO CADIZ SPILL

0484 " CONTAMINATION, BIOLOGICAL EFFECTS, OFFSHORE, MARINE ENVIRONMENT, ESTUARIES,
MODELS, *PROCEEDINGS

0485 " COASTAL WATERS, BAYS, ALASKA, OIL SPILLS, SHORELINES, *VULNERABILITY INDEX

0486 " COST ANALYSIS, BEHAVIOR, HYDROCARBONS, FATE, POLLUTION CONTROL

0489 " EKOFISK BLOWOUT, NORTH SEA, OIL SLICKS

0492 " EKOFISK BLOWOUT, BEHAVIOR, NORTH SEA, FATE, *RESEARCH REVIEW

0493 " ECOSYSTEMS, COASTS, AMOCO CADIZ SPILL, MARINE ORGANISMS, SAMPLING, FRANCE,
*SPECIAL ISSUE

0498 " COST ANALYSIS, BOOK REVIEW, BEHAVIOR, HYDROCARBONS, FATE, POLLUTION CONTROL

0499 " BIBLIOGRAPHIES, MARINE ENVIRONMENT, ESTUARIES

0503 " COASTS, AMOCO CADIZ SPILL, FRANCE

0505 " BOOK REVIEW, OIL SPILLS, EXPLORATION, PRODUCTION

0508 " COASTAL WATERS, BEHAVIOR, SPILL CLEANUP, IXTOC 1 BLOWOUT, TEXAS, OIL SLICKS

0509 " CHRONIC EFFECTS, OIL SPILLS

0511 " DELAWARE, ATLANTIC COAST, OIL SPILLS, *SEA GRANT RESEARCH

0512 " COASTS, BEHAVIOR, AMOCO CADIZ SPILL, ACUTE EFFECTS, SEDIMENTATION

0513 " BIODEGRADATION, BEHAVIOR, OIL SPILLS, STATISTICS, SPILL CLEANUP, TANKERS, SHIPS,
SPILL CONTAINMENT, *GENERAL REVIEW

0514 " ECOSYSTEMS, CONTAMINATION, FATE, HYDROCARBONS, MARINE ORGANISMS, NOAA

0518 " BIODEGRADATION, MICROORGANISMS, POLLUTION CONTROL, SPILL RESPONSE, *CONTAINED
SPILLS

0539 " BIODEGRADATION, MICROORGANISMS

0558 " DRIFT, BEHAVIOR, MOVEMENT, OIL SLICKS, GULF OF MEXICO, IXTOC 1 BLOWOUT

0567 " DISPERSANTS, COASTAL WATERS, ARCTIC, SHORELINES, *EXPERIMENTAL SPILLS

0573 " COLD CLIMATES, PHYSICAL EFFECTS, FATE, MARINE ENVIRONMENT, SUBARCTIC REGIONS

0583 " DISTRIBUTION, CONCENTRATIONS, NATURAL SEEPAGE, HYDROCARBONS, MOLLUSKS, GULF OF
MEXICO

0585 " COASTAL WATERS, CHRONIC EFFECTS, HYDROCARBONS, PORTS, MAINE

0590 " OIL SPILLS, MARINE ENVIRONMENT

0609 " DRILLING, CORAL REEFS, OFFSHORE, PLATFORMS, MARINE ORGANISMS, FISHERIES, *DRILLING
MUDS

0626 " DEVELOPMENT, LEGISLATION, OCS, OFFSHORE, GUIDELINES, POLLUTION CONTROL

0628 " ALASKA, OIL INDUSTRY, WILDLIFE, HABITATS

0632 " OIL SHALE, EXTRACTION, VEGETATION

0633 " CHEESAPEAKE BAY, BIOLOGICAL EFFECTS, REFINERIES, ESTUARIES, MOLLUSKS, FISHTRIPS,
*OYSTERS

0634 " DRILLING, COASTS, OIL SPILLS, ONSHORE IMPACTS, SOCIOECONOMIC EFFECTS

0635 " CRUDE OIL, COST ANALYSIS, OIL INDUSTRY, FISHERIES, FISH, MARINE ORGANISMS,
SOCIOECONOMIC EFFECTS

0636 " OIL SHALE, WATER QUALITY, WILDLIFE, HABITATS, SOCIOECONOMIC EFFECTS

0637 " CONTAMINATION, *ENHANCED OIL RECOVERY

0639 " DEVELOPMENT, BASELINE STUDIES, OIL SHALE, PRODUCTION, MONITORING, *PROCEEDINGS

0640 " DEVELOPMENT, COASTAL WATERS, UN, MARINE ENVIRONMENT, SHIPS, OFFSHORE, *PROCEEDINGS

0642 " DRILLING, SURVEILLANCE, OIL WELLS, *ENHANCED OIL RECOVERY

0644 " DRILLING, CANADA, OFFSHORE, SAFETY, PREDICTIONS, *LANCASTER SOUND

0645 " ECONOMICS, FISHERIES, US, OFFSHORE, PRODUCTION

0646 " DRILLING, FOSSIL FUELS, PIPELINES, STORAGE

0647 " ECOSYSTEMS, DRILLING, OFFSHORE, PRODUCTION, ESTUARIES, LOUISIANA

0648 " DEVELOPMENT, OIL-GAS LEASING, OFFSHORE, OCS, PRODUCTION, FISHERIES, RESOURCE
MANAGEMENT, SANTA BARBARA CHANNEL

0649 " OCS, OFFSHORE, OIL INDUSTRY, FISHERIES, SOCIOECONOMIC EFFECTS, LOUISIANA, GULF OF
MEXICO

0652 " DISPOSAL, CANADA, WASTEWATERS, ONSHORE IMPACTS, *DRILLING MUDS, *ALBERTA

0653 " IXTOC 1 BLOWOUT, GULF OF MEXICO

0655 " COLD CLIMATES, ALASKA, US GOVERNMENT, OIL-GAS LEASING, SPILL RESPONSE

0657 " DEVELOPMENT, EPA, OIL SHALE, POLLUTION PREVENTION, POLLUTION CONTROL, REGULATIONS,
*ENFORCEMENT

0658 ENVIRONMENTAL EFFECTS, DISPOSAL, WASTEWATERS, OIL FIELDS, OIL WELLS, ONSHORE, OIL
INDUSTRY, GROUNDWATER, WILDLIFE, LAKES, *PLAYAS
0672 " COASTS, AMOCO CADIZ SPILL, TOXICITY, MARINE ORGANISMS, SPILL CLEANUP, FRANCE
0682 " OIL TRANSFER, OIL TRANSPORT, HARBORS
0683 " CANADA, PORTS, PACIFIC COAST, OIL TRANSFER, OIL TRANSPORT, RISK ANALYSIS
0684 " CANADA, PORTS, PACIFIC COAST, OIL TRANSFER, OIL TRANSPORT, RISK ANALYSIS
0686 " HARBORS, PORTS, SHIPS, TEXAS, GULF OF MEXICO, *ENVIRONMENTAL MANAGEMENT
0687 " BALLAST, ALASKA, STORAGE, PORTS, OIL TANKS, OIL-WATER SEPARATION
0697 " ECONOMICS, OIL TRANSPORT, OIL TRANSFER, TANKERS, PACIFIC OCEAN, PORTS, *MALACCA
STRAITS, *PALAU
0216 EPA, CONTINGENCY PLANNING, GOVERNMENT AGENCIES, LEGISLATION, USCG, *WPCA
0242 " DESIGN-ENGINEERING, PERFORMANCE TESTING, EQUIPMENT, SPILL CLEANUP, *OHIOSETT TEST
FACILITY
0359 " ENVIRONMENTAL EFFECTS, ECOSYSTEMS, BIOLOGICAL EFFECTS, WILDLIFE, *USFWS
0554 " CONTAMINATION, MODELS, FATE
0657 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL SHALE, POLLUTION PREVENTION, POLLUTION
CONTROL, REGULATIONS, *ENFORCEMENT
0709 " REFINING, WASTEWATERS, SAMPLING, *PRIORITY POLLUTANTS
0002 EQUIPMENT, TRANS-ALASKA PIPELINE, SPILL RESPONSE, PERFORMANCE TESTING
0005 " LEAKAGE, OIL DISCHARGES, PIPELINES, OIL TRANSFER, MONITORING, OIL TANKS
0011 " DRIFT, MONITORING, MOVEMENT, ICE, *TRACKING BUOYS
0012 " DRIFT, MONITORING, MOVEMENT, ICE, *TRACKING BUOYS
0022 " DESIGN-ENGINEERING, OIL SLICKS, PATENT
0024 " DETECTION, DESIGN-ENGINEERING, OIL SLICKS, PATENT
0041 " REMOTE SENSING, MONITORING, *SPACE TECHNOLOGY
0043 " DETECTION, REMOTE SENSING, PERFORMANCE TESTING, MONITORING, OIL SPILLS,
*SCATTEROMETER, *RADAR
0046 " DESIGN-ENGINEERING, REMOTE SENSING, USCG, SURVEILLANCE, *ROSS II
0095 " DETECTION, CHEMICAL ANALYSIS, PETROLEUM PRODUCTS, *FIELD DEPLOYABLE INSTRUMENT
0131 " DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, PATENT
0132 " DESIGN-ENGINEERING, SPILL CONTAINMENT, PERFORMANCE TESTING, RIVERS, *AIR BUOY
DIVER
0137 " DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, SPILL REMOVAL, PATENT
0138 " SPILL CLEANUP, SPILL RESPONSE, OIL SLICKS, *KHC SLICKTRAIL
0140 " BOOMS, BEACH CLEANUP, SPILL CLEANUP, SKIMMERS
0141 " SPILL CLEANUP, SPILL REMOVAL, PERFORMANCE TESTING, UK, SORBENTS, *POLYPROPYLENE MOP
0144 " SPILL CLEANUP, SKIMMERS, SHIPS, OIL-WATER SEPARATION
0147 " BEACH CLEANUP, SEDIMENTS, PATENT, *CRYOGENIC METHOD
0149 " COLD CLIMATES, SPILL CLEANUP, SKIMMERS, PERFORMANCE TESTING
0154 " DESIGN-ENGINEERING, ADSORPTION, SPILL CLEANUP, PERFORMANCE TESTING
0158 " DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS, PATENT
0160 " SORBENTS, OIL SLICKS, SPILL REMOVAL, *FOAM STRIPS
0164 " SPILL CLEANUP, INCINERATION, PERFORMANCE TESTING, *KURDISTAN SPILL
0166 " SPILL REMOVAL, OIL-WATER SEPARATION, PRODUCT INFORMATION
0169 " DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, SPILL CLEANUP, SKIMMERS, PERFORMANCE
TESTING, UK
0171 " DISPERSANTS, CONTINGENCY PLANNING, AMOCO CADIZ SPILL, SPILL CLEANUP, SPILL RESPONSE
0173 " SPILL REMOVAL, OIL SLICKS, PATENT
0175 " SPILL CLEANUP, SKIMMERS, GRAVITY SEPARATION, PATENT
0177 " SPILL CLEANUP, OIL-WATER SEPARATION, WASTEWATERS, SKIMMERS, PATENT
0178 " SPILL CLEANUP, SKIMMERS, PERFORMANCE TESTING, PRODUCT INFORMATION
0181 " DESIGN-ENGINEERING, SPILL CONTAINMENT, SPILL REMOVAL, PATENT
0183 " SPILL CLEANUP, SKIMMERS, PERFORMANCE TESTING, PRODUCT INFORMATION
0185 " DESIGN-ENGINEERING, SPILL CLEANUP, SKIMMERS, PERFORMANCE TESTING, *FRINGER
0186 " DESIGN-ENGINEERING, BEACH CLEANUP, SPILL DISPOSAL, TAR, INCINERATION
0187 " SKIMMERS, PERFORMANCE TESTING, OIL-WATER SEPARATION, SPILL RECOVERY, *PUMPS
0190 " DISPERSANTS, CALIFORNIA, PERSONNEL TRAINING, PERFORMANCE TESTING, SPILL CLEANUP,
OIL INDUSTRY, USCG
0191 " CONTINGENCY PLANNING, PERSONNEL TRAINING, SPILL CLEANUP, OIL REMOVAL
0199 " CONTINGENCY PLANNING, SPILL RESPONSE, USCG, INFORMATION SYSTEMS, STATISTICAL
ANALYSIS, SIMULATIONS, *LOGISTICS
0200 " BEHAVIOR, SPILL RESPONSE, USCG, STATISTICAL ANALYSIS, INFORMATION SYSTEMS,
TANKERS, OIL SLICKS
0205 " CONTINGENCY PLANNING, CANADA, PREDICTIONS, SPILL RESPONSE, GOVERNMENT AGENCIES,
OIL INDUSTRY, OFFSHORE, EXPLORATION, LABRADOR SEA
0208 " BOOMS, SPILL CONTAINMENT, SPILL CLEANUP, SKIMMERS, *DEPLOYMENT METHODS
0211 " CONTINGENCY PLANNING, CANADA, SPILL RESPONSE, OIL INDUSTRY, ONSHORE, *PRAIRIES
0213 " CONTINGENCY PLANNING, SPILL RESPONSE, SPILL CLEANUP
0231 " BLOWOUTS, POLLUTION CONTROL, REGULATIONS, PRODUCT INFORMATION, INTERNATIONAL
AGREEMENTS, OIL-WATER SEPARATION
0232 " BLOWOUT PREVENTION, BIBLIOGRAPHIES, SPILL CLEANUP, POLLUTION PREVENTION, POLLUTION
CONTROL
0234 " COLD CLIMATES, CANADA, BURNING, SPILL REMOVAL, PERFORMANCE TESTING, *INCENDIARY
DEVICES
0238 " SPILL CLEANUP, FISHERIES, *FISHING GEAR CLEANUP

0242 EQUIPMENT, EPA, DESIGN-ENGINEERING, PERFORMANCE TESTING, SPILL CLEANUP, *OHMSETT TEST FACILITY

0526 " CRUDE OIL, BIODEGRADATION, BACTERIA, TAR SANDS, SEAWATER, HYDROCARBONS, PHYSICAL EFFECTS, *TEMPERATURE

0593 " BURNING, BEHAVIOR, ARCTIC, FATE, ICE, PERFORMANCE TESTING

0665 " OIL TRANSPORT, TANKERS, OIL DISCHARGES, POLLUTION CONTROL, PERSONNEL TRAINING, INTERNATIONAL AGREEMENTS, *SUBSTANDARD SHIPS

0729 " CONTAMINATION, OIL-WATER SEPARATION, PATENT

0730 " EMULSIONS, ADSORPTION, OIL-WATER SEPARATION, WASTEWATERS, INDUSTRIES, FLOTATION, FILTRATION

0031 ESTUARIES, DISTRIBUTION, HYDROCARBONS, PAH, GC/MS, SEDIMENTS, *DIATOMS

0044 " DETECTION, BIBLIOGRAPHIES, REMOTE SENSING, MONITORING, POLLUTION CONTROL

0110 " CRANKCASE OIL, CONTAMINATION, CONCENTRATIONS, SOURCES, HYDROCARBONS, REFINERIES, WASTEWATERS, *URBAN RUNOFF

0126 " SOURCE IDENTIFICATION, HYDROCARBONS, INDUSTRIES, OIL DISCHARGES, UK, *VOLATILE FRACTIONS

0127 " DISTRIBUTION, SOURCE IDENTIFICATION, PAH, SEDIMENTS, NARRAGANSETT BAY

0130 " DELAWARE, CONTAMINATION, SOURCE IDENTIFICATION, INDUSTRIES

0265 " CRUDE OIL, CONTAMINATION, CHRONIC EFFECTS, BIOASSAY, MOLLUSKS, SEDIMENTS, *OYSTERS

0282 " ECOSYSTEMS, CRUSTACEANS, CRUDE OIL, CHRONIC EFFECTS, SIMULATIONS, MOLLUSKS, *OYSTERS, *SHRIMP, *ENZYMATIC ACTIVITIES

0283 " ECOSYSTEMS, CRUDE OIL, CHRONIC EFFECTS, SIMULATIONS, FISH, *STRIPED MULLET, *ENZYMATIC ACTIVITIES

0361 " DELAWARE, CRUDE OIL, CHRONIC EFFECTS, FUEL OIL, TOXICITY, MORTALITY, MOLLUSKS, *CRASSOSTREA VIRGINICA

0425 " FATE, FUEL OIL, MARSHES, RECOVERY, PLANTS, MASSACHUSETTS

0462 " CONTAMINATION, COASTS, AMOCO CADIZ SPILL, FRANCE

0477 " BIOLOGICAL EFFECTS, UK, FISHERIES

0484 " ENVIRONMENTAL EFFECTS, CONTAMINATION, BIOLOGICAL EFFECTS, OFFSHORE, MARINE ENVIRONMENT, MODELS, *PROCEEDINGS

0499 " ENVIRONMENTAL EFFECTS, BIBLIOGRAPHIES, MARINE ENVIRONMENT

0524 " COASTS, BIODEGRADATION, BACTERIA, FRESHWATER, NORTH CAROLINA

0587 " COASTAL WATERS, BIODEGRADATION, PAH, UPTAKE, METABOLISM, OXIDATION

0612 " DRILLING, BIOLOGICAL EFFECTS, BENTHOS, TOXICITY, OFFSHORE, MARINE ORGANISMS, *BIOCIDES

0633 " ENVIRONMENTAL EFFECTS, CHESAPEAKE BAY, BIOLOGICAL EFFECTS, REFINERIES, MOLLUSKS, FISHERIES, *OYSTERS

0643 " DEVELOPMENT, COASTS, ALASKA, OCS, OIL DISCHARGES, OFFSHORE, OREGON, WASHINGTON, PACIFIC COAST

0647 " ENVIRONMENTAL EFFECTS, ECOSYSTEMS, DRILLING, OFFSHORE, PRODUCTION, LOUISIANA

0228 EUROPE, CONTINGENCY PLANNING, AMOCO CADIZ SPILL, INTERNATIONAL AGREEMENTS, REGULATIONS

0452 " AMOCO CADIZ SPILL, REGULATIONS, INTERNATIONAL CONVENTIONS, *ZEC

0676 " CONTAMINATION, PIPELINES, OIL SPILLS, RECOVERY

0677 " PIPELINES, STATISTICS, OIL SPILLS, SPILL REMOVAL, OIL INDUSTRY

0698 " DISPOSAL, REFINERIES, MARINE ENVIRONMENT, TOXICITY, WASTEWATER TREATMENT

0542 EVAPORATION, OIL SLICKS, PHYSICAL ASPECTS, *WIND WAVES

0205 EXPLORATION, EQUIPMENT, CONTINGENCY PLANNING, CANADA, PREDICTIONS, SPILL RESPONSE, GOVERNMENT AGENCIES, OIL INDUSTRY, OFFSHORE, LABRADOR SEA

0436 " CONTAMINATION, BIRDS, BRANCHES, BASELINE STUDIES, ATLANTIC COAST, OFFSHORE

0487 " DEVELOPMENT, DETECTION, CONTAMINATION, GROUNDWATER, MONITORING, UK, *CONFERENCE

0505 " ENVIRONMENTAL EFFECTS, BOOK REVIEW, OIL SPILLS, PRODUCTION

0614 " DRILLING, CHEMICAL EFFECTS, CHEMICAL ANALYSIS, CANADA, ARCTIC, TOXICITY, OFFSHORE, WASTEWATER DISPOSAL, *DRILLING MUDS

0619 " ECONOMIC EFFECTS, ATLANTIC COAST, OFFSHORE, PRODUCTION, GULF OF MEXICO, WATER QUALITY

0620 " ECONOMICS, DRILLING, CANADA, SOCIOECONOMIC EFFECTS, OFFSHORE

0622 " INTERNATIONAL CONVENTIONS, LIABILITY, OFFSHORE, REGULATIONS, OIL INDUSTRY

0641 " DRILLING, FISHERIES, OIL INDUSTRY, PLATFORMS, OFFSHORE, NORWAY, NORTH SEA

0651 " ECOSYSTEMS, ECONOMICS, DEVELOPMENT, COASTAL WATERS, OFFSHORE, RESOURCE MANAGEMENT, LOUISIANA

0598 EXTRACTION, OIL SHALE, WASTEWATERS, TOXICITY, FISH, *RAINBOW TROUT, *FATHEAD MINNOWS

0601 " CARCINOGENS, HEALTH HAZARDS, OIL SHALE, TAR, WASTEWATERS, USSR, *PHENOLS, *ESTONIA

0602 " CARCINOGENS, OIL SHALE, HEALTH HAZARDS, MORTALITY, OIL INDUSTRY, US, *SHALE OIL WORKERS

0603 " CRUDE OIL, MUTAGENS, HEALTH HAZARDS, PAH, WASTEWATERS, OIL SHALE

0605 " CONCENTRATIONS, BIOLOGICAL EFFECTS, OIL SHALE, WASTEWATERS, METABOLISM

0606 " OIL SHALE, PRODUCTION, WASTEWATERS, TOXICITY, METABOLISM, MAMMALS, *RATS

0608 " CHRONIC EFFECTS, CARCINOGENS, OIL SHALE, OIL INDUSTRY, USSR, *CANCER INCIDENCE, *ESTONIA

0610 " CHEMICAL EFFECTS, CHEMICAL ANALYSIS, TOXICITY, OIL SHALE, WASTEWATERS, WATER QUALITY

0632 " ENVIRONMENTAL EFFECTS, OIL SHALE, VEGETATION

0723 " WASTEWATER TREATMENT, SOLID WASTES, REFINING, ENVIRONMENTAL EFFECTS

0052 FATE, DISTRIBUTION, CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES, HYDROCARBONS, SAMPLING

0399 FATE, ACUTE EFFECTS, SUBLETHAL EFFECTS, MARINE ORGANISMS, HYDROCARBONS, ESTUARIES, REFINERIES, WASTEWATERS

0410 " EKOFISK BLOWOUT, DISTRIBUTION, BEHAVIOR, NORTH SEA, OIL SLICKS

0411 " BEACHES, AMOCO CADIZ SPILL, SEDIMENTATION, SEDIMENTS, INTERTIDAL ZONE, SHORELINES, FRANCE

0417 " BLOWOUTS, BEHAVIOR, PHYSICAL ASPECTS, SEAWATER, SEA SURFACE, MOVEMENT

0425 " ESTUARIES, FUEL OIL, MARSHES, RECOVERY, PLANTS, MASSACHUSETTS

0434 " COLD CLIMATES, BEHAVIOR, BASELINE STUDIES, ALASKA, MOVEMENT, PHYSICAL EFFECTS, SPREADING, ICE

0435 " ALASKA, ADSORPTION, HYDROCARBONS, OCS, PHYSICAL EFFECTS, *SUSPENDED MATTER

0470 " CONTAMINATION, BOOK REVIEW, BIODEGRADATION, AQUATIC ENVIRONMENT, ANALYTICAL TECHNIQUES, SOURCES

0480 " CRUDE OIL, COASTS, BIRDS, BIOLOGICAL EFFECTS, BEHAVIOR, BEACHES, MARINE ENVIRONMENT, FISH, MARINE ORGANISMS, HEALTH HAZARDS

0481 " ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, GUIDELINES, HYDROCARBONS, MARINE ENVIRONMENT

0486 " ENVIRONMENTAL EFFECTS, COST ANALYSIS, BEHAVIOR, HYDROCARBONS, POLLUTION CONTROL

0491 " BIRDS, BIODEGRADATION, BEHAVIOR, AMOCO CADIZ SPILL, MONITORING, SEDIMENTS, SEAWATER, MICROORGANISMS, TOXICITY, FISH

0492 " ENVIRONMENTAL EFFECTS, EKOFISK BLOWOUT, BEHAVIOR, NORTH SEA, *RESEARCH REVIEW

0498 " ENVIRONMENTAL EFFECTS, COST ANALYSIS, BOOK REVIEW, BEHAVIOR, HYDROCARBONS, POLLUTION CONTROL

0514 " ENVIRONMENTAL EFFECTS, ECOSYSTEMS, CONTAMINATION, HYDROCARBONS, MARINE ORGANISMS, NOAA

0529 " CRUDE OIL, CONTAMINATION, BIODEGRADATION, ALASKA, LAND FARMING, PLANTS, SOIL

0536 " CRUDE OIL, BIOLOGICAL EFFECTS, BIODEGRADATION, ARCTIC, MICROORGANISMS, SOIL, *TUNDRA

0543 " ATLANTIC OCEAN, HYDROCARBONS, PETROLEUM PRODUCTS, SEDIMENTS, MOVEMENT, *NEW YORK BIGHT

0546 " EMULSIONS, CRUDE OIL, PHYSICAL EFFECTS, *EMULSION-SOLID INTERACTION

0551 " CONCENTRATIONS, CHEMICAL EFFECTS, BAYS, PAH, SOURCES, SEDIMENTS, WASHINGTON, ZOOPLANKTON, *FECAL PELLETS

0554 " EPA, CONTAMINATION, MODELS

0562 " BEHAVIOR, ICE, SIMULATIONS, OIL INDUSTRY, *PACK ICE, *APOA

0572 " CONCENTRATIONS, AQUATIC ENVIRONMENT, ANALYTICAL TECHNIQUES, PAH, HYDROCARBONS, TOXICITY

0573 " ENVIRONMENTAL EFFECTS, COLD CLIMATES, PHYSICAL EFFECTS, MARINE ENVIRONMENT, SUBARCTIC REGIONS

0574 " BEHAVIOR, OIL SPILLS, OCS, NORWAY

0575 " EKOFISK BLOWOUT, CRUDE OIL, OIL SLICKS, WEATHERING, NORTH SEA

0576 " CONTAMINATION, ARGO MERCHANT SPILL, HYDROCARBONS, SEDIMENTS, MODELS, TOXICITY

0577 " BEHAVIOR, OFFSHORE

0578 " DISPERSION, HYDROCARBONS, SEAWATER, SEDIMENTS, MARINE ENVIRONMENT

0579 " ALASKA, NATURAL SEEPAGE, HYDROCARBONS

0580 " CRUDE OIL, BEHAVIOR, OIL DISCHARGES, OFFSHORE, PRODUCTION, OIL FIELDS, NORTH SEA

0581 " EKOFISK BLOWOUT, CRUDE OIL, BLOWOUTS, BEHAVIOR, OIL DISCHARGES, NORTH SEA, OFFSHORE

0582 " BEHAVIOR, PHYSICAL ASPECTS, REMOTE SENSING

0584 " CARIBBEAN SEA, BIOLOGICAL EFFECTS, NATURAL SEEPAGE, HYDROCARBONS, GULF OF MEXICO

0586 " EKOFISK BLOWOUT, BEHAVIOR, NORTH SEA, OIL SLICKS, MOVEMENT

0598 " CHEMICAL EFFECTS, BIODEGRADATION, BEHAVIOR, PHYSICAL ASPECTS, WEATHERING, PETROLEUM PRODUCTS, MARINE ENVIRONMENT

0589 " DISPERSION, BIODEGRADATION, OIL SPILLS, SEA SURFACE, WEATHERING, SEDIMENTATION, MICROORGANISMS

0591 " AROMATIC HYDROCARBONS, METABOLISM, MARINE ORGANISMS, UPTAKE

0592 " COLD CLIMATES, BEHAVIOR, BEAUFORT SEA, ARCTIC, PHYSICAL ASPECTS, OIL SPILLS, ICE

0593 " EQUIPMENT, BURNING, BEHAVIOR, ARCTIC, ICE, PERFORMANCE TESTING

0322 FILTRATION, CRUDE OIL, CONTAMINATION, CASPIAN SEA, TOXICITY, MOLLUSKS, USSR, GROWTH

0714 " ABSORPTION, WASTEWATER TREATMENT, REFINERIES, *ACTIVATED CARBON

0728 " COALESCENCE, OIL-WATER SEPARATION, OIL REMOVAL, SORBENTS, PRODUCT INFORMATION, *MODIFIED PEAT

0730 " EQUIPMENT, EMULSIONS, ADSORPTION, OIL-WATER SEPARATION, WASTEWATERS, INDUSTRIES, FLOTATION

0507 FINLAND, COASTAL WATERS, BIRDS, OIL DISCHARGES

0062 FISH, DISTRIBUTION, CONTAMINATION, CONCENTRATIONS, SAMPLING, FRESHWATER, SEDIMENTS, VEGETATION, *TETRAALKYLLEAD COMPOUNDS

0087 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, METABOLISM, *METABOLITES

0091 " CRUDE OIL, CONTAMINATION, CHEMICAL ANALYSIS, UPTAKE, GC/MS, *ORGANIC SULFUR COMPOUNDS

0092 " CHEMICAL ANALYSIS, HYDROCARBONS, MOLLUSKS, *SULFUR COMPOUNDS, *SUSPENSIONS

0097 " CHEMICAL ANALYSIS, MARINE ORGANISMS, PAH, MOLLUSKS

0100 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, HYDROCARBONS, SEDIMENTS

0254 " HYDROCARBONS, UPTAKE, METABOLISM, *TOLUENE, *BENZENE

0269 " METABOLISM, PAH, *ENZYME ACTIVITY

0270 " UPTAKE, HYDROCARBONS, FOOD WEB, INVERTEBRATES, *BLUEGILL SUNFISH, *MOSQUITO

0271 " EKOFISK BLOWOUT, BIOLOGICAL EFFECTS, NORTH SEA, ZOOPLANKTON, *EGGS AND LARVAE

0276 FISH, ACUTE EFFECTS, PETROCHEMICALS, TOXICITY, HYDROCARBONS, *GOLDFISH
0283 " ESTUARIES, ECOSYSTEMS, CRUDE OIL, CHRONIC EFFECTS, SIMULATIONS, *STRIPED BULL",
*ENZYME ACTIVITIES
0284 " DISPERSANTS, CRUSTACEANS, TOXICITY, GROWTH, *MILKFISH, *GRASS SHRIMP
0286 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, UPTAKE, METABOLISM,
*COHO SALMON, *NAPHTHALENE
0291 " CRUSTACEANS, CONTAMINATION, CARCINOGENS, PAH, UPTAKE, MOLLUSKS, *COMMERCIAL
SEAFOODS, *CREOSOTE
0293 " COASTAL WATERS, BIOINDICATORS, BEHAVIOR, INVERTEBRATES, MARINE ORGANISMS,
MONITORING
0299 " PAH, *RAINBOW TROUT, *MIXED-FUNCTION OXIDASE ACTIVITY
0300 " CRUDE OIL, BIOLOGICAL EFFECTS, BACTERIA, *MULLET, *FIN EROSION, *BACTERIOLOGICAL
ASPECTS
0324 " BIOLOGICAL EFFECTS, ACUTE EFFECTS, METABOLISM, STATISTICAL ANALYSIS
0328 " DEPURATION, AROMATIC HYDROCARBONS, UPTAKE, METABOLISM, *PACIFIC HERRING, *BENEFIT,
*TOLUENE
0331 " EKOFISK BLOWOUT, NORTH SEA
0340 " DEVELOPMENT, CRUDE OIL, CONCENTRATIONS, HYDROCARBONS, GROWTH, *EMBRYOS, *JAPANESE
MEDAKA
0341 " AROMATIC HYDROCARBONS, TOXICITY, UPTAKE, METABOLISM, *FUNDULUS HETEROCILITUS,
*NAPHTHALENE, *SALINITY
0347 " DISPERSANTS, CRUDE OIL, ACUTE EFFECTS, *SALMO GAIARDNERI, *SERUM GLUCOSE AND
SODIUM, *GILL MORPHOLOGY
0348 " DISPERSANTS, BIOLOGICAL EFFECTS, FUEL OIL, UPTAKE
0350 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, METABOLISM, *METABOLITES
0353 " DEPURATION, CHRONIC EFFECTS, ACUTE EFFECTS, UPTAKE, PAH, *ACCUMULATION, *RAINBOW
TROUT, *NAPHTHALENE
0354 " CRUSTACEANS, CONTAMINATION, AMOCO CADIZ SPILL, FISHERIES, MOLLUSKS, FRANCE
0362 " DEPURATION, CRUDE OIL, CONCENTRATIONS, AROMATIC HYDROCARBONS, UPTAKE, *ORGANIC
SULFUR COMPOUNDS
0364 " UPTAKE, METABOLISM, HYDROCARBONS, *SALINE, *PHENANTHRENE
0366 " CRUSTACEANS, AROMATIC HYDROCARBONS, METABOLISM, INVERTEBRATES, MOLLUSKS
0377 " METABOLISM, WSP, PETROLEUM PRODUCTS, *CARP, *LIPIDS
0379 " DEVELOPMENT, WSP, HYDROCARBONS, MORTALITY, GROWTH, *FUNDULUS HETEROCILITUS
0381 " ACUTE EFFECTS, GULF OF ALASKA, *PACIFIC HERRING ROE
0382 " DEVELOPMENT, CRUDE OIL, CONCENTRATIONS, WSP, GROWTH, *PACIFIC HERRING, *EMBRYOS
0383 " AROMATIC HYDROCARBONS, UPTAKE, METABOLISM, *RAINBOW TROUT, *PHENANTHRENE
0384 " DEPURATION, CRUDE OIL, UPTAKE, PAH, *COALFISH, *PHENANTHRENE
0446 " BIRDS, BIOLOGICAL EFFECTS, BASELINE STUDIES, FISHERIES, RESOURCE MANAGEMENT,
MARINE MAMMALS, LABRADOR SEA
0459 " ENVIRONMENTAL EFFECTS, EKOFISK BLOWOUT, NORTH SEA, FLANKTON
0480 " FATE, CRUDE OIL, COASTS, BIRDS, BIOLOGICAL EFFECTS, BEHAVIOR, BEACHES, MARINE
ENVIRONMENT, MARINE ORGANISMS, HEALTH HAZARDS
0491 " FATE, BIRDS, BIODEGRADATION, BEHAVIOR, AMOCO CADIZ SPILL, MONITORING, SEDIMENTS,
SEAWATER, MICROORGANISMS, TOXICITY
0532 " BIOINDICATORS, BIODEGRADATION, METABOLISM, MONITORING
0598 " EXTRACTION, OIL SHALE, WASTEWATERS, TOXICITY, *RAINBOW TROUT, *PATHAD MINNOWS
0611 " DEVELOPMENT, CANADA, BIOLOGICAL EFFECTS, ONSHORE, WILDLIFE, *ALBERTA
0635 " ENVIRONMENTAL EFFECTS, CRUDE OIL, COST ANALYSIS, OIL INDUSTRY, FISHERIES, MARINE
ORGANISMS, SOCIOECONOMIC EFFECTS
0675 " PIPELINES, PUGET SOUND, FISHERIES, ENVIRONMENTAL EFFECTS, *SALMON
0679 " PIPELINES, TRANS-ALASKA PIPELINE, WILDLIFE, GOVERNMENT AGENCIES, REGULATIONS
0203 FISHERIES, BIRDS, SPILL RESPONSE, GOVERNMENT AGENCIES, UK, *OLEN V SPILL
0238 " EQUIPMENT, SPILL CLEANUP, *FISHING GEAR CLEANUP
0306 " BIOLOGICAL EFFECTS, REFINERIES, JAPAN, *SEIO INLAND SEA, *MARICULTURE, *SEAWATERS
0354 " FISH, CRUSTACEANS, CONTAMINATION, AMOCO CADIZ SPILL, MOLLUSKS, FRANCE
0363 " BIRDS, REFINERIES, MARINE MAMMALS, MAINE
0395 " ECONOMICS, BIOINDICATORS, MOLLUSKS, *LITTLENECK CLAMS
0446 " FISH, BIRDS, BIOLOGICAL EFFECTS, BASELINE STUDIES, RESOURCE MANAGEMENT, MARINE
MAMMALS, LABRADOR SEA
0449 " DEVELOPMENT, COASTS, BEAUFORT SEA, BASELINE STUDIES, ALASKA, WILDLIFE, OFFSHORE
0467 " ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, COASTAL WATERS, FRANCE
0477 " ESTUARIES, BIOLOGICAL EFFECTS, UK
0488 " DEVELOPMENT, MARINE ENVIRONMENT, OFFSHORE, OCS, NEW YORK
0609 " ENVIRONMENTAL EFFECTS, DRILLING, CORAL REEFS, OFFSHORE, PLATFORMS, MARINE
ORGANISMS, *DRILLING MUDS
0624 " DRILLING, DEVELOPMENT, ATLANTIC COAST, RESOURCE MANAGEMENT, OCS, GEORGES BANK,
HABITATS
0633 " ESTUARIES, ENVIRONMENTAL EFFECTS, CHESAPEAKE BAY, BIOLOGICAL EFFECTS, REFINERIES,
MOLLUSKS, *OYSTERS
0635 " FISH, ENVIRONMENTAL EFFECTS, CRUDE OIL, COST ANALYSIS, OIL INDUSTRY, MARINE
ORGANISMS, SOCIOECONOMIC EFFECTS
0641 " EXPLORATION, DRILLING, OIL INDUSTRY, PLATFORMS, OFFSHORE, NORWAY, NORTH SEA
0645 " ENVIRONMENTAL EFFECTS, ECONOMICS, US, OFFSHORE, PRODUCTION

0648 FISHFISHES, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, OFFSHORE, OCS, PRODUCTION, RESOURCE MANAGEMENT, SANTA BARBARA CHANNEL
 0649 " ENVIRONMENTAL EFFECTS, OCS, OFFSHORE, OIL INDUSTRY, SOCIOECONOMIC EFFECTS, LOUISIANA, GULF OF MEXICO
 0654 " DRILLING, OFFSHORE, GEORGES BANK, OIL-GAS LEASING, US GOVERNMENT
 0659 " DEVELOPMENT, ATLANTIC COAST, OCS, RISK ANALYSIS
 0675 " FISH, PIPELINES, PUGET SOUND, ENVIRONMENTAL EFFECTS, *SALMON
 0694 " SHIPS, OIL SPILLS, NEW JERSEY, *TOURISM
 0702 FLOCCULATION, CONTAMINATION, BIODEGRADATION, WASTEWATER TREATMENT, REFINERIES, OIL-WATER SEPARATION, SLUDGE
 0432 FLORIDA, BASELINE STUDIES, ALABAMA, MISSISSIPPI, OCS, *MAPLA SURVEY
 0433 " BASELINE STUDIES, ALABAMA, MISSISSIPPI, OCS, *MAPLA SURVEY
 0730 FLOTATION, FILTRATION, EQUIPMENT, EMULSIONS, ADSORPTION, OIL-WATER SEPARATION, WASTEWATERS, INDUSTRIES
 0270 FOOD WEB, FISH, UPTAKE, HYDROCARBONS, INVERTEBRATES, *BLUEGILL SUNFISH, *MOSQUITO
 0399 " CRUDE OIL, BIOLOGICAL EFFECTS, FISH, UPTAKE, METABOLISM, *RETENTION
 0616 " SEDIMENTS, SEDIMENTATION, OFFSHORE, PRODUCTION, MARINE ORGANISMS, UPTAKE, METABOLISM, *HEAVY METALS
 0599 FOSSIL FUELS, CRUDE OIL, CARCINOGENS, BIOASSAY, AROMATIC HYDROCARBONS, OIL SHALE, HEALTH HAZARDS, *PNA
 0646 " ENVIRONMENTAL EFFECTS, DRILLING, PIPELINES, STORAGE
 0038 FRANCE, CONTAMINATION, COASTAL WATERS, AMOCO CADIZ SPILL, REMOTE SENSING
 0039 " DETECTION, REMOTE SENSING, SHORELINES
 0085 " ENGLISH CHANNEL, ANALYTICAL TECHNIQUES, AMOCO CADIZ SPILL, SAMPLING, SEAWATER, SEDIMENTS
 0089 " CONCENTRATIONS, COASTS, BAYS, AMOCO CADIZ SPILL, HYDROCARBONS, SEAWATER
 0207 " CRUDE OIL, AMOCO CADIZ SPILL, SPILL RESPONSE, HYDROCARBONS, POLLUTION CONTROL
 0215 " CONTINGENCY PLANNING, AMOCO CADIZ SPILL, SPILL RESPONSE, *COMMISSION REPORT
 0218 " CONTINGENCY PLANNING, SPILL RESPONSE
 0312 " DISTRIBUTION, COASTAL WATERS, BENTHOS, AMOCO CADIZ SPILL, MORTALITY, SUBLETHAL EFFECTS, MARINE ORGANISMS
 0319 " ENGLISH CHANNEL, BIRDS, AMOCO CADIZ SPILL, MORTALITY
 0354 " FISHERIES, FISH, CRUSTACEANS, CONTAMINATION, AMOCO CADIZ SPILL, MOLLUSKS
 0376 " COASTAL WATERS, BIONASS, BIOLOGICAL EFFECTS, AMOCO CADIZ SPILL, ZOOPLANKTON
 0406 " DISTRIBUTION, COASTS, AMOCO CADIZ SPILL, PHYSICAL EFFECTS, SHORELINES, SEDIMENTATION, INTERTIDAL ZONE
 0411 " FATE, BRANCHES, AMOCO CADIZ SPILL, SEDIMENTATION, SEDIMENTS, INTERTIDAL ZONE, SHORELINES
 0462 " ESTUARIES, CONTAMINATION, COASTS, AMOCO CADIZ SPILL
 0467 " FISHERIES, ENVIRONMENTAL EFFECTS, ECONOMIC EFFECTS, COASTAL WATERS
 0475 " ENVIRONMENTAL EFFECTS, COASTS, AMOCO CADIZ SPILL, SHORELINES, STATISTICS
 0479 " ENVIRONMENTAL EFFECTS, COASTAL WATERS, AMOCO CADIZ SPILL
 0493 " ENVIRONMENTAL EFFECTS, ECOSYSTEMS, COASTS, AMOCO CADIZ SPILL, MARINE ORGANISMS, SAMPLING, *SPECIAL ISSUE
 0497 " CONTINGENCY PLANNING, AMOCO CADIZ SPILL, SPILL RESPONSE, *ISTPH
 0503 " ENVIRONMENTAL EFFECTS, COASTS, AMOCO CADIZ SPILL
 0672 " ENVIRONMENTAL EFFECTS, COASTS, AMOCO CADIZ SPILL, TOXICITY, MARINE ORGANISMS, SPILL CLEANUP
 0691 " DRILLING, TANKERS, SHIPS, OFFSHORE, OIL SPILLS, SOURCES, INFORMATION SYSTEMS, *DATA BANK, *ACCIDENTS
 0693 " AMOCO CADIZ SPILL, TANKERS, *GROUNDINGS, *PHOTOGRAPHY
 0736 " DENMARK, WASTE OIL, REGULATIONS, LEGISLATION, RECYCLING, REUSE, GERMANY, UK, ITALY, US
 0741 " COASTS, AMOCO CADIZ SPILL, *DINOFLLAGELLATE BLOOMS
 0748 " AMOCO CADIZ SPILL, US, *RESEARCH REVIEW
 0054 FRESHWATER, CONCENTRATIONS, CHEMICAL ANALYSIS, CANADA, PAH, OXIDATION, GROUNDWATER, *ONTARIO
 0062 " FISH, DISTRIBUTION, CONTAMINATION, CONCENTRATIONS, SAMPLING, SEDIMENTS, VEGETATION, *TETRAALKYLEAD COMPOUNDS
 0066 " CONCENTRATIONS, CHEMICAL ANALYSIS, HYDROCARBONS, *GON
 0079 " ECOSYSTEMS, CRUDE OIL, CONTAMINATION, BIODEGRADATION, BACTERIA, ARCTIC, SEAWATER, GASOLINE, STATISTICAL ANALYSIS
 0124 " SOURCE IDENTIFICATION, PAH, SEDIMENTS, GROUNDWATER, MARINE ENVIRONMENT, GC/MS
 0273 " CRUDE OIL, BENTHOS, BACTERIA, ALGAE, FUEL OIL, WASTE OIL, TOXICITY, METABOLISM, *COMMUNITIES
 0412 " CONTAMINATION, AROMATIC HYDROCARBONS, ADSORPTION, ABSORPTION, SEDIMENTS, RIVERS, LAKES
 0519 " CRUDE OIL, BIODEGRADATION, ARCTIC, MICROORGANISMS, RIVERS, *MUTAGENIC ACTIVITY
 0524 " ESTUARIES, COASTS, BIODEGRADATION, BACTERIA, NORTH CAROLINA
 0537 " BIODEGRADATION, SAMPLING, MICROORGANISMS, PAH, *PHENANTHRENE
 0121 FUEL OIL, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, SPECTROMETRY
 0256 " CRUDE OIL, BIRDS, REPRODUCTION, *CASSIN'S AUKLETS
 0264 " BIRDS, TOXICITY, MORTALITY, NORWAY, *SPUNNICH'S GUILLENOTS
 0267 " CRUDE OIL, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, ALGAE, TOXICITY, MICROORGANISMS, *DIATOMS

0272 FUEL OIL, BEHAVIOR, AROMATIC HYDROCARBONS, TOXICITY, WSP, SUBLETHAL EFFECTS, *BAYWACHT
LARVAE
0273 " FRESHWATER, CRUDE OIL, BENTHOS, BACTERIA, ALGAE, WASTE OIL, TOXICITY, METABOLISM,
*COMMUNITIES
0275 " COASTS, BIRDS, OIL SPILLS, MARINE ORGANISMS, SCOTLAND
0277 " CRUSTACEANS, CRUDE OIL, ARCTIC, MORTALITY, *AMPHIPODS
0278 " OXIDATION, TOXICITY, MUTAGENS, FEASTS, *PHOTOPRODUCTS
0302 " ECOSYSTEMS, CHRONIC EFFECTS, BENTHOS, *HEEL EXPERIMENTS
0304 " CRUSTACEANS, WASTEWATERS, REFINERIES, TOXICITY, *GRASS SHRIMP
0325 " BIRDS, MORTALITY, REPRODUCTION, *LAUGHING GULLS
0333 " CRUSTACEANS, CONCENTRATIONS, CHRONIC EFFECTS, WSP, TOXICITY, *MUD CRABS
0337 " AROMATIC HYDROCARBONS, TOXICITY, MARINE ORGANISMS, *AMPHIPODS, *ELASMODS PECTENICUS
0343 " COASTAL WATERS, BALTIC SEA, ACUTE EFFECTS, MARINE ORGANISMS, *TSPSIS SPILL
0348 " FISH, DISPERSANTS, BIOLOGICAL EFFECTS, UPTAKE
0361 " ESTUARIES, DELAWARE, CRUDE OIL, CHRONIC EFFECTS, TOXICITY, MORTALITY, HOLLERS,
*CRASSOSTREA VIRGINICA
0392 " CRUSTACEANS, BEHAVIOR, TOXICITY, *LINULUS POLYPHYMUS, *MOLTING
0400 " BIRDS, TOXICITY, REPRODUCTION, *JAPANESE QUAIL
0425 " FATE, ESTUARIES, MARSHES, RECOVERY, PLANTS, MASSACHUSETTS
0717 " DISPOSAL, BIODEGRADATION, WASTEWATERS, WASTE OIL, LAND FARMING, RECLAMATION
0720 " DISPOSAL, CRUDE OIL, CRACKCASE OIL, BIOLOGICAL EFFECTS, WASTE OIL, LAND FARMING,
MONITORING, PLANTS, SOIL
0731 " DISPOSAL, WASTE OIL, RECYCLING, REFINING, REUSE, LAND FARMING, *COMBUSTION
0395 FUNGI, CRUDE OIL, BIOLOGICAL EFFECTS, BACTERIA, ALASKA, SOIL, *HOT OIL, *TAIGA SOIL
0531 " EKOFISK BLOWOUT, BIODEGRADATION, BACTERIA, NORTH SEA
0535 " BIODEGRADATION, BACTERIA, MICROORGANISMS, HYDROCARBONS
0079 GASOLINE, FRESHWATER, ECOSYSTEMS, CRUDE OIL, CONTAMINATION, BIODEGRADATION, BACTERIA,
ARCTIC, SEAWATER, STATISTICAL ANALYSIS
0495 " GROUNDWATER, RIVERS, UK, *AIRPORTS
0031 GC/MS, ESTUARIES, DISTRIBUTION, HYDROCARBONS, PAH, SEDIMENTS, *DIATOMS
0051 " DEPURATION, CRUDE OIL, CHRONIC EFFECTS, CHEMNATOGRAPHY, BENTHOS, ANALYTICAL
TECHNIQUES, HYDROCARBONS, INVERTEBRATES
0091 " FISH, CRUDE OIL, CONTAMINATION, CHEMICAL ANALYSIS, UPTAKE, *ORGANIC SULFUR
COMPOUNDS
0094 " DISTRIBUTION, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, SEDIMENTS, SOURCES
0115 " SOURCE IDENTIFICATION, SAMPLING, HYDROCARBONS, WEATHERING
0124 " FRESHWATER, SOURCE IDENTIFICATION, PAH, SEDIMENTS, GROUNDWATER, MARINE ENVIRONMENT
0501 " CHEMICAL ANALYSIS, AMOCO CADIZ SPILL, OXIDATION
0057 GEORGES BANK, CHEMICAL ANALYSIS, ATLANTIC OCEAN, HYDROCARBONS, SEAWATER
0624 " FISHERIES, DRILLING, DEVELOPMENT, ATLANTIC COAST, RESOURCE MANAGEMENT, OCS,
HABITATS
0654 " FISHERIES, DRILLING, OFFSHORE, OIL-GAS LEASING, US GOVERNMENT
GREENLAND, FRANCE, DENMARK, WASTE OIL, REGULATIONS, LEGISLATION, RECYCLING, REUSE, UK,
ITALY, US
0193 GOVERNMENT AGENCIES, CONTINGENCY PLANNING, SPILL RESPONSE, UK
0203 " FISHERIES, BIRDS, SPILL RESPONSE, UK, *ELENI V SPILL
0205 " EXPLORATION, EQUIPMENT, CONTINGENCY PLANNING, CANADA, PREDICTIONS, SPILL RESPONSE,
OIL INDUSTRY, OFFSHORE, LABRADOR SEA
0206 " CONTINGENCY PLANNING, SPILL RESPONSE, WILDLIFE, *USFWS
0209 " DISPERSANTS, SPILL RESPONSE, REGULATIONS, *APPLICATION PROCEDURES
0412 " CONTINGENCY PLANNING, BIOLOGICAL EFFECTS, SPILL RESPONSE, WILDLIFE, PERSONNEL
TRAINING, *TSPS, *WORKSHOP
0216 " EPA, CONTINGENCY PLANNING, LEGISLATION, USCG, *FWPCA
0221 " CONTINGENCY PLANNING, SPILL RESPONSE, PERSONNEL TRAINING, *USFWS
0222 " CONTINGENCY PLANNING, CALIFORNIA, BIRDS, SPILL RESPONSE, POLLUTION CONTROL
0229 " DISPERSANTS, POLLUTION PREVENTION, SPILL CONTAINMENT, SPILL CLEANUP, UK
0422 " SPILL RESPONSE, *NEWS MEDIA, *INFORMATION DISSEMINATION
0453 " COMPENSATION, STATE GOVERNMENTS, *SPILL DAMAGES
0627 " OCS, OIL-GAS LEASING, LEGISLATION, US
0630 " EKOFISK BLOWOUT, NORTH SEA, NORWAY
0663 " TANKERS, OIL SPILLS, SPILL RESPONSE, UK, *ELENI V SPILL
0679 " FISH, PIPELINES, TRANS-ALASKA PIPELINE, WILDLIFE, REGULATIONS
0734 " DISPOSAL, WASTE OIL, RECLAMATION, REFINING, REUSE, LEGISLATION, *BUREAU OF MINES
0175 GRAVITY SEPARATION, EQUIPMENT, SPILL CLEANUP, SKINNERS, PATENT
0019 GREENLAND, SAMPLING, HYDROCARBONS, MARINE ORGANISMS, SEDIMENTS
0054 GROUNDWATER, FRESHWATER, CONCENTRATIONS, CHEMICAL ANALYSIS, CANADA, PAH, OXIDATION,
*ONTARIO
0124 " GC/MS, FRESHWATER, SOURCE IDENTIFICATION, PAH, SEDIMENTS, MARINE ENVIRONMENT
0233 " DISPOSAL, CONTAMINATION, OIL SPILLS, POLLUTION PREVENTION, OIL REMOVAL, RECOVERY,
RESTORATION
0476 " LEAKAGE, OIL SPILLS, WATER QUALITY
0487 " EXPLORATION, DEVELOPMENT, DETECTION, CONTAMINATION, MONITORING, UK, *CONFERENCE
0495 " GASOLINE, RIVERS, UK, *ALBERTA
0502 " DISPOSAL, CONTAMINATION, INDUSTRIES, LEAKAGE, OIL DISCHARGES, WASTEWATERS
0521 " BIODEGRADATION, SLUDGE, LAND FARMING, SOIL, *LEACHATES

0557 GROUNDWATER, DISPERSION, SOURCE IDENTIFICATION, HYDROCARBONS
 0570 " CONTAMINATION, PETROLEUM PRODUCTS
 0651 " ENVIRONMENTAL EFFECTS, DISPOSAL, WASTEWATERS, OIL FIELDS, OIL WELLS, ONSHORE, OIL
 INDUSTRY, WILDLIFE, LAKES, *PLAYAS
 0260 GROWTH, CRUDE OIL, CHRONIC EFFECTS, BENTHOS, BACTERIA, ACUTE EFFECTS, OCS, TEXAS
 0294 " FISH, DISPERSANTS, CRUSTACEANS, TOXICITY, *MILKFISH, *GRASS SHRIMP
 0297 " CRUDE OIL, MARSHES, PLANTS, SEDIMENTS, *SPARTINA ALTERNIFLORA
 0301 " CRUDE OIL, BIRDS, TOXICITY
 0308 " BIRDS, AROMATIC HYDROCARBONS, TOXICITY, *MALLARD DUCKS
 0309 " DEVELOPMENT, CRUDE OIL, BIRDS, TOXICITY, *MALLARD DUCKS, *NICKEL, *VANADIUM
 0314 " DISTRIBUTION, BIOLOGICAL EFFECTS, HYDROCARBONS, SAMPLING, PHYTOPLANKTON
 0322 " FILTRATION, CRUDE OIL, CONTAMINATION, CASPIAN SEA, TOXICITY, MOLLUSKS, USSR
 0338 " DEVELOPMENT, CRUDE OIL, BIOLOGICAL EFFECTS, MOLLUSKS, *MYTILUS EDULIS
 0340 " FISH, DEVELOPMENT, CRUDE OIL, CONCENTRATIONS, HYDROCARBONS, *EMBRYOS, *JAPANESE
 REDAKA
 0379 " FISH, DEVELOPMENT, WSP, HYDROCARBONS, MORTALITY, *FUNDULUS HETEROCLOTUS
 0382 " FISH, DEVELOPMENT, CRUDE OIL, CONCENTRATIONS, WSP, *PACIFIC HERRING, *EMBRYOS
 0390 " DEVELOPMENT, DEGRADATION, BIRDS, ANALYTICAL TECHNIQUES, TOXICITY, HYDROCARBONS,
 UPTAKE, *RESEARCH REVIEW
 0394 " DISPERSANTS, TOXICITY, PETROLEUM PRODUCTS, PHYTOPLANKTON, *DIATOMS, *EMULSIFIERS
 GUIDELINES, BIBLIOGRAPHIES, SPILL CLEANUP, SPILL DISPOSAL, MODELS
 0153 " DISPERSANTS, SPILL CLEANUP, SPILL RESPONSE, MANUALS
 0155 " DISPERSANTS, SPILL REMOVAL
 0159 " CONTINGENCY PLANNING, SPILL CLEANUP, SPILL RESPONSE, PERSONNEL TRAINING, MANUALS
 0162 " DISPERSANTS, SPILL CLEANUP, MANUALS, SPILL RESPONSE
 0202 " CONTINGENCY PLANNING, SPILL RESPONSE, NEW YORK, NEW JERSEY
 0401 " FATE, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, HYDROCARBONS, MARINE ENVIRONMENT
 0626 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, LEGISLATION, OCS, OFFSHORE, POLLUTION CONTROL
 0690 " TANKERS, REGULATIONS, SAFETY, POLLUTION PREVENTION, PERSONNEL TRAINING, USCG, OIL
 TRANSPORT
 0091 GULF OF ALASKA, CHEMICAL ANALYSIS, BERING SEA, BEAUFORT SEA, SEDIMENTS
 0092 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, BERING SEA, SEDIMENTS
 0381 " FISH, ACUTE EFFECTS, *PACIFIC HERRING ROE
 0391 " CALIFORNIA, PETROLEUM PRODUCTS, MOLLUSKS, MORTALITY, TOXICITY, PACIFIC COAST
 0564 " RISK ANALYSIS, OIL SPILLS, OCS, OIL-GAS LEASING
 0371 GULF OF MEXICO, BIRDS, BIOLOGICAL EFFECTS, IXTOC 1 BLOWOUT, INVERTEBRATES, MARINE
 ORGANISMS
 0460 " ENVIRONMENTAL EFFECTS, IXTOC 1 BLOWOUT, OFFSHORE, PERSONNEL TRAINING, REGULATIONS
 0596 " CONCENTRATIONS, CHEMICAL ANALYSIS, HYDROCARBONS, MARINE ENVIRONMENT, SOURCES,
 TOXICITY, MARINE ORGANISMS, *VOLATILE LIQUID FRACTIONS
 0523 " BIODEGRADATION, BACTERIA, OFFSHORE, OIL FIELDS, *BACTERIOLOGICAL ASPECTS
 0554 " ENVIRONMENTAL EFFECTS, DRIFT, BEHAVIOR, MOVEMENT, OIL SLICKS, IXTOC 1 BLOWOUT
 0571 " CHEMICAL ANALYSIS, NATURAL SEEPAGE, HYDROCARBONS, TAR, SAMPLING
 0593 " ENVIRONMENTAL EFFECTS, DISTRIBUTION, CONCENTRATIONS, NATURAL SEEPAGE, HYDROCARBONS,
 MOLLUSKS
 0584 " FATE, CARIBBEAN SEA, BIOLOGICAL EFFECTS, NATURAL SEEPAGE, HYDROCARBONS
 0604 " DEGRADATION, CRUSTACEANS, CONCENTRATIONS, PLATFORMS, UPTAKE, HYDROCARBONS,
 *BARNACLES, *ALKANES
 0619 " EXPLORATION, ECONOMIC EFFECTS, ATLANTIC COAST, OFFSHORE, PRODUCTION, WATER QUALITY
 0629 " DRILLING, OFFSHORE, IXTOC 1 BLOWOUT
 0649 " FISHERIES, ENVIRONMENTAL EFFECTS, OCS, OFFSHORE, OIL INDUSTRY, SOCIOECONOMIC
 EFFECTS, LOUISIANA
 0653 " ENVIRONMENTAL EFFECTS, IXTOC 1 BLOWOUT
 0686 " ENVIRONMENTAL EFFECTS, HARBORS, PORTS, SHIPS, TEXAS, *ENVIRONMENTAL MANAGEMENT
 0746 " BIODEGRADATION, BACTERIA, *IRON REQUIREMENTS
 0247 HABITATS, BIRDS, POLLUTION PREVENTION, WILDLIFE, RESTORATION
 0313 " ECOSYSTEMS, BIOLOGICAL EFFECTS, MARINE ORGANISMS, HYDROCARBONS
 0460 " ENVIRONMENTAL EFFECTS, ECOSYSTEMS, OFFSHORE, PRODUCTION, OCS, PLATFORMS, TEXAS,
 *BUCCANEER OIL FIELD
 0624 " GEORGE BANK, FISHERIES, DRILLING, DEVELOPMENT, ATLANTIC COAST, RESOURCE
 MANAGEMENT, OCS
 0628 " ENVIRONMENTAL EFFECTS, ALASKA, OIL INDUSTRY, WILDLIFE
 0636 " ENVIRONMENTAL EFFECTS, OIL SHALE, WATER QUALITY, WILDLIFE, SOCIOECONOMIC EFFECTS
 0749 " DISTRIBUTION, COASTAL WATERS, CALIFORNIA, MARINE ORGANISMS, PLATFORMS, OFFSHORE
 0194 HARBORS, BAYS, SHIPS, OIL SPILLS, SPILL CLEANUP, NEW YORK
 0279 " COASTAL WATERS, BIRDS, OIL SLICKS, MORTALITY, UK
 0560 " PREDICTIONS, OIL SLICKS, SPILL TRAJECTORIES, *HAWAII
 0669 " TANKERS, SHIPS, TEXAS, *M/V AMCO SCEPTRE COLLISION
 0682 " ENVIRONMENTAL EFFECTS, OIL TRANSPORT, OIL TRANSPORT
 0686 " GULF OF MEXICO, ENVIRONMENTAL EFFECTS, PORTS, SHIPS, TEXAS, *ENVIRONMENTAL
 MANAGEMENT
 0692 " CALIFORNIA, HYDROCARBONS, OIL TRANSPORT, PORTS, OIL TRANSFER
 0471 HEALTH HAZARDS, ENVIRONMENTAL EFFECTS, DISPERSANTS, SOCIOECONOMIC EFFECTS, *PENNY AR
 BED JOURNAL

0480 HEALTH HAZARDS, FISH, FATE, CRUDE OIL, COASTS, BIRDS, BIOLOGICAL EFFECTS, BEHAVIOR,
 BEACHES, MARINE ENVIRONMENT, MARINE ORGANISMS
 0599 " FOSSIL FUELS, CRUDE OIL, CARCINOGENS, BIOASSAY, AROMATIC HYDROCARBONS, OIL SHALE,
 *PNA
 0600 " CRUDE OIL, CARCINOGENS, PETROLEUM PRODUCTS, TAR, OIL SHALE, USSR, *BENZ(A)PYRENE,
 *ESTONIA
 0601 " EXTRACTION, CARCINOGENS, OIL SHALE, TAR, WASTEWATERS, USSR, *PHENOLS, *ESTONIA
 0602 " EXTRACTION, CARCINOGENS, OIL SHALE, MORTALITY, OIL INDUSTRY, US, *SHALE OIL WORKFES
 0603 " EXTRACTION, CRUDE OIL, MUTAGENS, PAH, WASTEWATERS, OIL SHALE
 0613 " CHRONIC EFFECTS, ANIMALS, OIL SHALE, PETROLEUM PRODUCTS, TOXICITY, USSR, *PHENOLS,
 *ESTONIA
 0003 HYDROCARBONS, CONCENTRATIONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, BIOGENIC HYDROCARBONS
 0006 " CONTAMINATION, SHORELINES, MONITORING, *HONG KONG
 0019 " GREENLAND, SAMPLING, MARINE ORGANISMS, SEDIMENTS
 0020 " DETECTION, CONCENTRATIONS, CANADA, ARCTIC, SEAWATER, SEDIMENTS, *BAFFIN BAY
 0021 " ANALYTICAL TECHNIQUES, SEAWATER, *FLUORESCENCE SPECTROPHOTOMETRY
 0027 " DETECTION, CRUSTACEANS, UPTAKE, *NAPHTHALENE, *CALLINECTES SAPIDUS
 0030 " CANADA, ARCTIC, SEAWATER, *HARMOT BASIN
 0031 " GC/MS, ESTUARIES, DISTRIBUTION, PAH, SEDIMENTS, *DIATOMS
 0051 " GC/MS, DEGRADATION, CRUDE OIL, CHRONIC EFFECTS, CHROMATOGRAPHY, BENTHOS, ANALYTICAL
 TECHNIQUES, INVERTEBRATES
 0052 " FATE, DISTRIBUTION, CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES, SAMPLING
 0056 " CHEMICAL ANALYSIS, ATLANTIC COAST, SAMPLING, PAH, OCS, SEDIMENTS
 0057 " GEORGES BANK, CHEMICAL ANALYSIS, ATLANTIC OCEAN, SEAWATER
 0058 " DISPERSION, DISPERSANTS, CONCENTRATIONS, CHEMICAL ANALYSIS
 0060 " CONCENTRATIONS, TANKERS, SAMPLING, MEDITERRANEAN SEA
 0066 " FRESHWATER, CONCENTRATIONS, CHEMICAL ANALYSIS, *GOA
 0068 " DETECTION, SAMPLING, SOURCES, MARINE ENVIRONMENT, *ATMOSPHERIC INPUTS
 0069 " CHROMATOGRAPHY, BIRDS, ANALYTICAL TECHNIQUES, SPECTROSCOPY, *MALLARD DUCKS
 0071 " EKOFISK BLOWOUT, DETECTION, CONCENTRATIONS, NORTH SEA, SEAWATER, SAMPLING
 0074 " CONCENTRATIONS, CHEMICAL ANALYSIS, SEDIMENTS, MARINE ENVIRONMENT, *NATIONAL BUREAU
 OF STANDARDS
 0075 " DISTRIBUTION, BIODEGRADATION, BACTERIA, PACIFIC OCEAN, *SOUTH CHINA SEA
 0076 " DETECTION, CHEMICAL ANALYSIS, SEDIMENTS, *INTERLABORATORY COMPARISON
 0077 " DISTRIBUTION, CONCENTRATIONS, SEDIMENTS, SAMPLING
 0078 " CONCENTRATIONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, ARGO MERCHANT SPILL, SEDIMENTS,
 *UV FLUORESCENCE
 0083 " CONTAMINATION, SAMPLING
 0089 " FRANCE, CONCENTRATIONS, COASTS, BAYS, AMOCO CADIZ SPILL, SEAWATER
 0092 " FISH, CHEMICAL ANALYSIS, MOLLUSKS, *SULFUR COMPOUNDS, *SUSPENSIONS
 0098 " BIODEGRADATION, BACTERIA, ATLANTIC OCEAN, MARINE ENVIRONMENT, SEDIMENTS, SEAWATER,
 *SCREENING
 0100 " FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SEDIMENTS
 0101 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, BIODEGRADATION, *ALKANES
 0108 " CHEMICAL ANALYSIS, SAMPLING, *FRACTIONATION
 0110 " ESTUARIES, CRANKCASE OIL, CONTAMINATION, CONCENTRATIONS, SOURCES, REFINERIES,
 WASTEWATERS, *URBAN RUNOFF
 0113 " CONCENTRATIONS, SAMPLING, MEDITERRANEAN SEA
 0115 " GC/MS, SOURCE IDENTIFICATION, SAMPLING, WEATHERING
 0125 " CHROMATOGRAPHY, SOURCE IDENTIFICATION, *URBAN RUNOFF
 0126 " ESTUARIES, SOURCE IDENTIFICATION, INDUSTRIES, OIL DISCHARGES, UK, *VOLATILE
 FRACTIONS
 0128 " DETECTION, BIOGENIC HYDROCARBONS, SOURCE IDENTIFICATION, MARINE ORGANISMS
 0207 " FRANCE, CRUDE OIL, AMOCO CADIZ SPILL, SPILL RESPONSE, POLLUTION CONTROL
 0254 " FISH, UPTAKE, METABOLISM, *TOLUENE, *BENZENE
 0262 " BIOASSAY, MOLLUSKS, UPTAKE, *CHRONIC POLLUTION, *MUSSELS
 0268 " BIOLOGICAL EFFECTS, MOLLUSKS, *MYTILUS EDULIS
 0270 " FOOD WEB, FISH, UPTAKE, INVERTEBRATES, *BLUEGILL SUNFISH, *MOSQUITO
 0276 " FISH, ACUTE EFFECTS, PETROCHEMICALS, TOXICITY, *GOLDFISH
 0280 " CONCENTRATIONS, CALIFORNIA, BIOLOGICAL EFFECTS, MOLLUSKS, WSP, *BYSSAL THREAD
 FORMATION
 0288 " CHRONIC EFFECTS, BIRDS, ANALYTICAL TECHNIQUES, ACUTE EFFECTS, TOXICITY, MORTALITY,
 WILDLIFE
 0310 " BIRDS, METABOLISM, *MALLARD DUCKS, *HYPOADRENOCORTICALISM
 0313 " HABITATS, ECOSYSTEMS, BIOLOGICAL EFFECTS, MARINE ORGANISMS
 0314 " GROWTH, DISTRIBUTION, BIOLOGICAL EFFECTS, SAMPLING, PHYTOPLANKTON
 0319 " CRUDE OIL, ACUTE EFFECTS, PHYTOPLANKTON, *PHOTOSYNTHESIS, *RESPIRATION
 0320 " UPTAKE, TOXICITY, MICROORGANISMS, *N-ALKANES, *DIATOMS
 0327 " BOOK REVIEW, TOXICITY, MARINE ORGANISMS, PETROLEUM PRODUCTS, METABOLISM, SUBLETHAL
 EFFECTS
 0336 " CRUSTACEANS, BIOINDICATORS, ANNELIDS, UPTAKE, METABOLISM, MARINE ORGANISMS,
 MOLLUSKS, *DETOXIFICATION MECHANISMS
 0340 " GROWTH, FISH, DEVELOPMENT, CRUDE OIL, CONCENTRATIONS, *EMERYOS, *JAPANESE MEDAKA
 0346 " CONTAMINATION, ANNELIDS, SEAWATER, SEDIMENTS, UPTAKE, *RELEASE, *ARENICOLA MARINA,
 *NAPHTHALENE

0359 HYDROCARBONS , BIODEGRADATION, BACTERIA, SEAWATER, SEDIMENTS, STATISTICAL ANALYSIS, JAPAN

0364 " FISH, UPTAKE, METABOLISM, *SAITHE, *PHENANTHRENE

0365 " BIRDS, SUBLETHAL EFFECTS, *MALLARD DUCKS, *HEPATIC FUNCTION

0374 " CONCENTRATIONS, BICASSAY, ALGAE, WSP, PHYTOPLANKTON

0379 " GROWTH, FISH, DEVELOPMENT, WSP, MORTALITY, *FUNDULUS HETEROCLOTUS

0390 " GROWTH, DEVELOPMENT, DEPURATION, BIRDS, ANALYTICAL TECHNIQUES, TOXICITY, UPTAKE, *RESEARCH REVIEW

0398 " FATE, ACUTE EFFECTS, SUBLETHAL EFFECTS, MARINE ORGANISMS, ESTUARIES, REFINERIES, WASTEWATERS

0402 " CRUDE OIL, OIL-WATER SEPARATION, *CHARGE-TRANSFER

0403 " DISTRIBUTION, DISPERSION, TOXICITY, PHYSICAL ASPECTS

0426 " BENTHOS, BASELINE STUDIES, ALASKA , MARINE ORGANISMS, UPTAKE, SEDIMENTS, OCS

0427 " BENTHOS, BASELINE STUDIES, ALASKA , MARINE ORGANISMS, UPTAKE, SEDIMENTS, OCS

0428 " BENTHOS, BASELINE STUDIES, ALASKA , MARINE ORGANISMS, UPTAKE, SEDIMENTS, OCS

0435 " FATE, ALASKA , ADSORPTION, OCS, PHYSICAL EFFECTS, *SUSPENDED MATTER

0442 " BASELINE STUDIES, ALASKA , SUBLETHAL EFFECTS, OCS, *TRACE METALS, *BIOTRANSFORMATIONS

0447 " DEPURATION, CHRONIC EFFECTS, BASELINE STUDIES, ALASKA , ACUTE EFFECTS, TOXICITY, UPTAKE, METABOLISM, ORGANISMS

0461 " CONTAMINATION, BOOK REVIEW, BIOLOGICAL EFFECTS, MARINE ORGANISMS

0464 " CONCENTRATIONS, BENTHOS, WASTEWATERS, OIL FIELDS, SEDIMENTS, MARINE ORGANISMS, TEXAS, *BRINES

0481 " GUIDELINES, FATE, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS, MARINE ENVIRONMENT

0486 " FATE, ENVIRONMENTAL EFFECTS, COST ANALYSIS, BEHAVIOR, POLLUTION CONTROL

0498 " FATE, ENVIRONMENTAL EFFECTS, COST ANALYSIS, BOOK REVIEW, BEHAVIOR, POLLUTION CONTROL

0506 " GULF OF MEXICO, CONCENTRATIONS, CHEMICAL ANALYSIS, MARINE ENVIRONMENT, SOURCES, TOXICITY, MARINE ORGANISMS, *VOLATILE LIQUID FRACTIONS

0514 " FATE, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, CONTAMINATION, MARINE ORGANISMS, NOAA

0526 " EQUIPMENT, CRUDE OIL, BIODEGRADATION, BACTERIA, TAR SANDS, SEAWATER, PHYSICAL EFFECTS, *TEMPERATURE

0530 " CRUDE OIL, CHEMICAL ANALYSIS, BIODEGRADATION, BACTERIA, SOIL

0533 " BIODEGRADATION, AROMATIC HYDROCARBONS, MICROORGANISMS, METABOLISM

0534 " BIODEGRADATION, METABOLISM, OXIDATION, *ALKANES

0535 " FUNGI, BIODEGRADATION, BACTERIA, MICROORGANISMS

0540 " BIODEGRADATION, BACTERIA, OIL REMOVAL, MICROORGANISMS, *ENHANCED OIL RECOVERY

0541 " CONTAMINATION, CHEMICAL ANALYSIS, MARINE ENVIRONMENT, *FLUOROMETRY

0543 " FATE, ATLANTIC OCEAN, PETROLEUM PRODUCTS, SEDIMENTS, MOVEMENT, *NEW YORK BIGHT

0557 " GROUNDWATER, DISPERSION, SOURCE IDENTIFICATION

0571 " GULF OF MEXICO, CHEMICAL ANALYSIS, NATURAL SEEPAGE, TAR, SAMPLING

0572 " FATE, CONCENTRATIONS, AQUATIC ENVIRONMENT, ANALYTICAL TECHNIQUES, PAH, TOXICITY

0576 " FATE, CONTAMINATION, ARGO MERCHANT SPILL, SEDIMENTS, MODELS, TOXICITY

0578 " FATE, DISPERSION, SEAWATER, SEDIMENTS, MARINE ENVIRONMENT

0579 " FATE, ALASKA , NATURAL SEEPAGE

0583 " GULF OF MEXICO, ENVIRONMENTAL EFFECTS, DISTRIBUTION, CONCENTRATIONS, NATURAL SEEPAGE, MOLLUSKS

0584 " GULF OF MEXICO, FATE, CARIBBEAN SEA, BIOLOGICAL EFFECTS, NATURAL SEEPAGE

0595 " ENVIRONMENTAL EFFECTS, COASTAL WATERS, CHRONIC EFFECTS, PORTS , MAINE

0604 " GULF OF MEXICO, DEPURATION, CRUSTACEANS, CONCENTRATIONS, PLATFORMS, UPTAKE, *BARNACLES, *ALKANES

0617 " DETECTION, WASTEWATERS, *IONIZATION

0692 " HARBORS, CALIFORNIA, OIL TRANSPORT, PORTS , OIL TRANSFER

0738 " BIONASS, BIOLOGICAL EFFECTS, PHYTOPLANKTON, MARINE ENVIRONMENT, *GTXI EXPERIMENT

0740 " DETECTION, CHEMICAL ANALYSIS, PHYSICAL ASPECTS, *INTERCALIBRATION WORKSHOP

0742 " DISPERSION, CONCENTRATIONS, SAMPLING, SOLUBILITY, SEAWATER, *WISKIN VS. BLUMFF SAMPLERS

0750 " BACTERIA, UPTAKE, METABOLISM, *CREOSOTE-TREATED PILLINGS, *ISOPODS, *LINNORIA

0011 ICE, EQUIPMENT, DRIFT, MONITORING, MOVEMENT, *TRACKING BUOYS

0012 " EQUIPMENT, DRIFT, MONITORING, MOVEMENT, *TRACKING BUOYS

0026 " DETECTION, DESIGN-ENGINEERING, MOVEMENT, MONITORING, REMOTE SENSING, PERFORMANCE TESTING

0184 " BURNING, ARCTIC, PERFORMANCE TESTING, SPILL REMOVAL, *COMBUSTION PROMOTERS

0195 " CONTINGENCY PLANNING, BLOWOUTS, BEAUFORT SEA, ARCTIC, SPILL RESPONSE, SPILL CONTAINMENT

0219 " CANADA, BEAUFORT SEA, ATLANTIC COAST, ARCTIC, SPILL RESPONSE, SPILL CLEANUP, *WORKSHOP OPINION SURVEY

0413 " COLD CLIMATES, ARCTIC, SEAWATER, *PERMEABILITY

0434 " FATE, COLD CLIMATES, BEHAVIOR, BASELINE STUDIES, ALASKA , MOVEMENT, PHYSICAL EFFECTS, SPREADING

0441 " BEHAVIOR, BASELINE STUDIES, ALASKA , OCS, MOVEMENT, *OIL POOLING

0553 " CRUDE OIL, BEHAVIOR, MOVEMENT, OIL SLICKS, *CURRENTS, *OIL-UNDER-ICE

0562 " FATE, BEHAVIOR, SIMULATIONS, OIL INDUSTRY, *PACK ICE, *APOA

0565 " CANADA, BLOWOUTS, PREDICTIONS, PHYSICAL ASPECTS, LABRADOR SEA

0592 ICE, FATE, COLD CLIMATES, BEHAVIOR, BRANFORD SEA, ARCTIC, PHYSICAL ASPECTS, OIL SPILLS
 0593 " FATE, EQUIPMENT, BURNING, BEHAVIOR, ARCTIC, PERFORMANCE TESTING
 0223 INCO, DISPERSANTS, CONTINGENCY PLANNING, INTERNATIONAL CONVENTIONS, OIL SPILLS, *NATL
 CENTRE
 0226 " COMPENSATION, OIL SPILLS, LIABILITY
 0246 " POLLUTION PREVENTION, INTERNATIONAL CONVENTIONS
 0668 " TANKERS, OIL SPILLS, OIL DISCHARGES, INTERNATIONAL AGREEMENTS, *PROCEEDINGS
 0164 INCINERATION, EQUIPMENT, SPILL CLEANUP, PERFORMANCE TESTING, *KURDISTAN SPILL
 0169 " SPILL DISPOSAL, SOLID WASTES
 0182 " DESIGN-ENGINEERING, SPILL CLEANUP, PETROCHEMICALS, SLUDGE, *DETOXIFICATION,
 *RESIDUAL OILS
 0186 " EQUIPMENT, DESIGN-ENGINEERING, BEACH CLEANUP, SPILL DISPOSAL, TAR
 0725 " SPILL CLEANUP, WASTEWATERS, SOLID WASTES, *DETOXIFICATION
 0405 INDIA, COASTS, BEACHS, TAR, *RESIDUAL OILS
 0126 INDUSTRIES, HYDROCARBONS, ESTUARIES, SOURCE IDENTIFICATION, OIL DISCHARGES, UK,
 *VOLATILE FRACTIONS
 0130 " ESTUARIES, DELAWARE, CONTAMINATION, SOURCE IDENTIFICATION
 0243 " CALIFORNIA, POLLUTION CONTROL, REGULATIONS, WASTEWATERS, OIL DISCHARGES
 0367 " CONTAMINATION, BENTHOS, WASTEWATERS, MARINE ENVIRONMENT
 0466 " ENVIRONMENTAL EFFECTS, BIOINDICATORS, MONITORING, MARINE ENVIRONMENT, OIL
 DISCHARGES, UK
 0502 " GROUNDWATER, DISPOSAL, CONTAMINATION, LEAKAGE, OIL DISCHARGES, WASTEWATERS
 0712 " DISPOSAL, WASTEWATERS, WASTE OIL, LAND FARMING
 0719 " ECONOMICS, WASTE OIL TREATMENT, WASTEWATER TREATMENT, *CAPABILITIES
 0721 " DISPOSAL, BOOK REVIEW, WASTEWATERS, WASTE OIL, LAND FARMING
 0722 " WASTEWATER TREATMENT, OIL REMOVAL, *ULTRAFILTRATION, *REVERSE OSMOSIS
 0726 " BIOLOGICAL TREATMENT, WASTEWATER TREATMENT, OIL REMOVAL, SLUDGE
 0730 " FLOTATION, FILTRATION, EQUIPMENT, EMULSIONS, ADSORPTION, OIL-WATER SEPARATION,
 WASTEWATERS
 0732 " CONSERVATION, WASTE OIL, RECYCLING, REFINING, RESOURCE MANAGEMENT, REGULATIONS
 0001 INFORMATION SYSTEMS, MONITORING, MANUALS, *METEOROLOGICAL SERVICES
 0120 " ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, OIL SPILLS, MODELS, *PATTERN
 RECOGNITION
 0199 " EQUIPMENT, CONTINGENCY PLANNING, SPILL RESPONSE, USCG, STATISTICAL ANALYSIS,
 SIMULATIONS, *LOGISTICS
 0200 " EQUIPMENT, BEHAVIOR, SPILL RESPONSE, USCG, STATISTICAL ANALYSIS, TANKERS, OIL
 SLICKS
 0225 " OIL SPILLS, RISK ANALYSIS, STATISTICS, USCG, *FIRS
 0556 " DETECTION, DESIGN-ENGINEERING, ANALYTICAL TECHNIQUES
 0691 " FRANCE, DRILLING, TANKERS, SHIPS, OFFSHORE, OIL SPILLS, SOURCES, *DATA BANK,
 *ACCIDENTS
 0696 " COASTAL WATERS, OIL SPILLS, STATISTICS, USCG, US, *1977-1978 DATA
 0743 " COASTAL WATERS, OIL SPILLS, *NEWSPAPER COVERAGE
 0228 INTERNATIONAL AGREEMENTS, EUROPE, CONTINGENCY PLANNING, AMOCO CADIZ SPILL, REGULATIONS
 0231 " EQUIPMENT, BLOWOUTS, POLLUTION CONTROL, REGULATIONS, PRODUCT INFORMATION,
 OIL-WATER SEPARATION
 0245 " ECOSYSTEMS, POLLUTION CONTROL, MARINE ORGANISMS, RED SEA, MONITORING, OIL
 INDUSTRY, WASTEWATERS, *ALESCO
 0249 " ECONOMICS, POLLUTION CONTROL, MARINE ENVIRONMENTS, LEGISLATION, *REVIEW
 0250 " POLLUTION CONTROL, MARINE ENVIRONMENT, *LAW OF THE SEA
 0454 " COASTAL WATERS, CANADA, LEGISLATION, POLLUTION CONTROL, MARINE ENVIRONMENT
 0623 " EKOFISK BLOWOUT, AMOCO CADIZ SPILL, REGULATIONS, OFFSHORE, PRODUCTION, NORTH SEA
 0665 " EQUIPMENT, OIL TRANSPORT, TANKERS, OIL DISCHARGES, POLLUTION CONTROL, PERSONNEL
 TRAINING, *SUBSTANDARD SHIPS
 0668 " INCO, TANKERS, OIL SPILLS, OIL DISCHARGES, *PROCEEDINGS
 0223 INTERNATIONAL CONVENTIONS, INCO, DISPERSANTS, CONTINGENCY PLANNING, OIL SPILLS, *NATL
 CENTRE
 0237 " BALTIC SEA, POLLUTION CONTROL, *ENVIRONMENTAL PROTECTION
 0244 " OIL INDUSTRY, REGULATIONS, US, LEGISLATION, POLLUTION CONTROL, *NAVIGATION AIDS
 0246 " INCO, POLLUTION PREVENTION
 0451 " POLLUTION PREVENTION, UK, KUWAIT, *MIDDLE EAST
 0452 " EUROPE, AMOCO CADIZ SPILL, REGULATIONS, *PEC
 0622 " EXPLORATION, LIABILITY, OFFSHORE, REGULATIONS, OIL INDUSTRY
 0157 INTERTIDAL ZONE, DISPERSANTS, BIOLOGICAL EFFECTS, BIOASSAY, BEACH CLEANUP, TOXICITY,
 PERFORMANCE TESTING
 0404 " ENVIRONMENTAL EFFECTS, BENTHOS, AMOCO CADIZ SPILL, SEDIMENTATION, *SEALED
 PENETRATION
 0406 " FRANCE, DISTRIBUTION, COASTS, AMOCO CADIZ SPILL, PHYSICAL EFFECTS, SHORELINES,
 SEDIMENTATION
 0411 " FRANCE, FATE, BEACHS, AMOCO CADIZ SPILL, SEDIMENTATION, SEDIMENTS, SHORELINES
 0404 " DISPERSION, BEACHES, PHYSICAL EFFECTS, WEATHERING, *MECHANICAL DISPERSAL
 0415 " DISTRIBUTION, CRUDE OIL, BEACHES, SEDIMENTATION, SPAIN, URQUIOLA SPILL
 0051 INVERTEBRATES, HYDROCARBONS, GC/MS, DEGRADATION, CRUDE OIL, CHRONIC EFFECTS,
 CHROMATOGRAPHY, BENTHOS, ANALYTICAL TECHNIQUES
 0270 " HYDROCARBONS, FOOD WEB, FISH, UPTAKE, *BLUEGILL SUNFISH, *MOSQUITO

0293 INVERTEBRATES, FISH, COASTAL WATERS, BIOINDICATORS, BEHAVIOR, MARINE ORGANISMS,
 MONITORING
 0366 " FISH, CRUSTACEANS, AROMATIC HYDROCARBONS, METABOLISM, MOLLUSKS
 0369 " CRUDE OIL, CANADA, ARCTIC, MARINE ORGANISMS
 0371 " GULF OF MEXICO, BIRDS, BIOLOGICAL EFFECTS, IXTOC 1 BLOWOUT, MARINE ORGANISMS
 0736 ITALY, GERMANY, FRANCE, DENMARK, WASTE OIL, REGULATIONS, LEGISLATION, RECYCLING,
 REUSE, UK, US
 0220 IXTOC 1 BLOWOUT, BLOWOUTS, PLATFORMS, SPILL RESPONSE
 0371 " INVERTEBRATES, GULF OF MEXICO, BIRDS, BIOLOGICAL EFFECTS, MARINE ORGANISMS
 0460 " GULF OF MEXICO, ENVIRONMENTAL EFFECTS, OFFSHORE, PERSONNEL TRAINING, REGULATIONS
 0508 " ENVIRONMENTAL EFFECTS, COASTAL WATERS, BEHAVIOR, SPILL CLEANUP, TEXAS, OIL SLICKS
 0558 " GULF OF MEXICO, ENVIRONMENTAL EFFECTS, DRIFT, BEHAVIOR, MOVEMENT, OIL SLICKS
 0629 " GULF OF MEXICO, DRILLING, OFFSHORE
 0650 " CONTINGENCY PLANNING, MEXICO
 0653 " GULF OF MEXICO, ENVIRONMENTAL EFFECTS
 0047 JAPAN, DISTRIBUTION, DETECTION, CONTAMINATION, REMOTE SENSING, *STRAITS OF TSURUSHIMA
 0090 " CONTAMINATION, CHEMICAL ANALYSIS, SEDIMENTS, PORTS, *OSAKA PORT
 0093 " CONTAMINATION, SAMPLING, MONITORING, SEAWATER
 0296 " CONTAMINATION, BIODEGRADATION, BACTERIA, SEAWATER, STATISTICAL ANALYSIS
 0306 " FISHERIES, BIOLOGICAL EFFECTS, REFINERIES, *SETO INLAND SEA, *MARICULTURE,
 *SEAWATERS
 0358 " HYDROCARBONS, BIODEGRADATION, BACTERIA, SEAWATER, SEDIMENTS, STATISTICAL ANALYSIS
 0451 KUWAIT, INTERNATIONAL CONVENTIONS, POLLUTION PREVENTION, UN, *MIDDLE EAST
 0205 LABRADOR SPA, GOVERNMENT AGENCIES, EXPLORATION, EQUIPMENT, CONTINGENCY PLANNING,
 CANADA, PREDICTIONS, SPILL RESPONSE, OIL INDUSTRY, OFFSHORE
 0210 " CONTINGENCY PLANNING, CANADA, BASELINE STUDIES, ARCTIC, MARINE ENVIRONMENT,
 *INFORMATION ATLAS
 0217 " CONTINGENCY PLANNING, BLOWOUTS, RISK ANALYSIS
 0224 " COASTS, CANADA, SPILL RESPONSE, *LOGISTICS, *SUPPORT SERVICES
 0251 " CONTINGENCY PLANNING, CANADA, BOOK REVIEW, BASELINE STUDIES, ARCTIC, MARINE
 ENVIRONMENT
 0443 " ENVIRONMENTAL EFFECTS, DRILLING, CANADA, BASELINE STUDIES, SPILL RESPONSE,
 MOVEMENT, PREDICTIONS, OCS, *TRAJECTORIES, *NEWFOUNDLAND
 0444 " ENVIRONMENTAL EFFECTS, DRILLING, CANADA, BLOWOUTS, BASELINE STUDIES, OCS,
 *NEWFOUNDLAND
 0445 " ENVIRONMENTAL EFFECTS, CANADA, BLOWOUTS, BASELINE STUDIES, OCS, *BIOLOGICAL
 DESCRIPTIONS
 0446 " FISHERIES, FISH, BIRDS, BIOLOGICAL EFFECTS, BASELINE STUDIES, RESOURCE MANAGEMENT,
 MARINE MAMMALS
 0559 " CONTINGENCY PLANNING, CANADA, BLOWOUTS, BASELINE STUDIES, SIMULATIONS, SPILL
 RESPONSE
 0565 " ICE, CANADA, BLOWOUTS, PREDICTIONS, PHYSICAL ASPECTS
 0105 LAKES, CONCENTRATIONS, SAMPLING, OIL SHALE, OIL INDUSTRY, WASTEWATERS, USSR, RIVERS,
 *ESTONIA
 0106 " DISTRIBUTION, SAMPLING, SEDIMENTS, *SWITZERLAND, *AZAARENES
 0107 " DISPERSION, AQUATIC ENVIRONMENT, SAMPLING, FAN, SOURCES, SEDIMENTS
 0355 " CRUDE OIL, BIOMASS, ARCTIC, ALGAE, METABOLISM, PLANKTON
 0412 " FRESHWATER, CONTAMINATION, AROMATIC HYDROCARBONS, ADSORPTION, ABSORPTION,
 SEDIMENTS, RIVERS
 0658 " GROUNDWATER, ENVIRONMENTAL EFFECTS, DISPOSAL, WASTEWATERS, OIL FIELDS, OIL WELLS,
 ONSHORE, OIL INDUSTRY, WILDLIFE, *PLAYAS
 0424 LAND FARMING, RESTORATION, SOIL, ONSHORE, RECLAMATION, OIL SPILLS, NEW JERSEY
 0515 " CHEMICAL EFFECTS, BIODEGRADATION, PHYSICAL ASPECTS, OXIDATION, SPILL CLEANUP,
 MICROORGANISMS, *STIMULATION
 0520 " DISPOSAL, BIODEGRADATION, SLUDGE, SOIL, STORAGE, REFINERIES
 0521 " GROUNDWATER, BIODEGRADATION, SLUDGE, SOIL, *LEACHATES
 0529 " FATE, CRUDE OIL, CONTAMINATION, BIODEGRADATION, ALASKA, PLANTS, SOIL
 0699 " EMULSIONS, DISPOSAL, WASTE OIL, SOIL, TOXICITY, PLANTS
 0711 " BURNING, SPILL CLEANUP, POLLUTION CONTROL, RECLAMATION, WASTE OIL TREATMENT
 0712 " INDUSTRIES, DISPOSAL, WASTEWATERS, WASTE OIL
 0717 " FUEL OIL, DISPOSAL, BIODEGRADATION, WASTEWATERS, WASTE OIL, RECLAMATION
 0718 " DISPOSAL, PLANTS, SOIL, WASTE OIL
 0720 " FUEL OIL, DISPOSAL, CRUDE OIL, CRANKCASE OIL, BIOLOGICAL EFFECTS, WASTE OIL,
 MONITORING, PLANTS, SOIL
 0721 " INDUSTRIES, DISPOSAL, BOOK REVIEW, WASTEWATERS, WASTE OIL
 0724 " DISPOSAL, WASTE OIL, SOIL, *LEACHING TEST
 0731 " FUEL OIL, DISPOSAL, WASTE OIL, RECYCLING, REFINING, REUSE, *COMBUSTION
 0456 LAW ENFORCEMENT, LEGISLATION, US, LIABILITY, USCG
 0005 LEAKAGE, EQUIPMENT, OIL DISCHARGES, PIPELINES, OIL TRANSFER, MONITORING, OIL TANKS
 0476 " GROUNDWATER, OIL SPILLS, WATER QUALITY
 0502 " INDUSTRIES, GROUNDWATER, DISPOSAL, CONTAMINATION, OIL DISCHARGES, WASTEWATERS
 0674 " PIPELINES, OIL SPILLS, TRANS-ALASKA PIPELINE, RIVERS
 0678 " PIPELINES, OIL TRANSPORT, *PIPELINE FAILURE
 0680 " DISPERSANTS, BIRDS, OIL TRANSFER, OIL SHALE, MORTALITY
 0145 LEGISLATION, ECONOMICS, US GOVERNMENT, SPILL CLEANUP, OIL INDUSTRY

0216 LEGISLATION, GOVERNMENT AGENCIES, EPA, CONTINGENCY PLANNING, USCG, *FWPCA
 0244 " INTERNATIONAL CONVENTIONS, OIL INDUSTRY, REGULATIONS, US, POLLUTION CONTROL,
 *NAVIGATION AIDS
 0249 " INTERNATIONAL AGREEMENTS, ECONOMICS, POLLUTION CONTROL, MARINE ENVIRONMENTS,
 *REVIEW
 0372 " DENMARK, BIOLOGICAL EFFECTS, MARINE ENVIRONMENT
 0454 " INTERNATIONAL AGREEMENTS, COASTAL WATERS, CANADA, POLLUTION CONTROL, MARINE
 ENVIRONMENT
 0455 " OIL DISCHARGES, REGULATIONS, US, LIABILITY
 0456 " LAW ENFORCEMENT, US, LIABILITY, USCG
 0621 " ATLANTIC COAST, OIL-GAS LEASING, OFFSHORE
 0625 " EIS, OIL INDUSTRY, OFFSHORE, OCS, POLLUTION CONTROL, US
 0626 " GUIDELINES, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OCS, OFFSHORE, POLLUTION CONTROL
 0627 " GOVERNMENT AGENCIES, OCS, OIL-GAS LEASING, US
 0734 " GOVERNMENT AGENCIES, DISPOSAL, WASTE OIL, RECLAMATION, REFINING, REUSE, *BUREAU
 OF MINES
 0735 " DISPOSAL, CALIFORNIA, WASTE OIL, RECYCLING, REGULATIONS, US, *MINNESOTA, *UTAH
 0736 " ITALY, GERMANY, FRANCE, DENMARK, WASTE OIL, REGULATIONS, RECYCLING, RUSSIA, UK, US
 0225 LIABILITY, IMCO, COMPENSATION, OIL SPILLS
 0227 " SPILL CLEANUP, REGULATIONS
 0455 " LEGISLATION, OIL DISCHARGES, REGULATIONS, US
 0456 " LEGISLATION, LAW ENFORCEMENT, US, USCG
 0457 " DEVELOPMENT, COMPENSATION, OFFSHORE, ONSHORE, SOURCES, RIVERS, POLLUTION CONTROL,
 UN, *UNEP CONVENTION
 0622 " INTERNATIONAL CONVENTIONS, EXPLORATION, OFFSHORE, REGULATIONS, OIL INDUSTRY
 0241 LOUISIANA, BLOWOUTS, POLLUTION CONTROL, OFFSHORE, PRODUCTION, PLATFORMS
 0647 " ESTUARIES, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, DRILLING, OFFSHORE, PRODUCTION
 0649 " GULF OF MEXICO, FISHERIES, ENVIRONMENTAL EFFECTS, OCS, OFFSHORE, OIL INDUSTRY,
 SOCIOECONOMIC EFFECTS
 0651 " EXPLORATION, ECOSYSTEMS, ECONOMICS, DEVELOPMENT, COASTAL WATERS, OFFSHORE,
 RESOURCE MANAGEMENT
 0363 MAINE, FISHERIES, BIRDS, REFINERIES, MARINE MAMMALS
 0401 " BIOLOGICAL EFFECTS, ATLANTIC COAST, MOLLUSKS, *OIL SPILL SITES, *MYA ARENARIA,
 *NEOPLASMS
 0585 " HYDROCARBONS, ENVIRONMENTAL EFFECTS, COASTAL WATERS, CHRONIC EFFECTS, PORTS
 0001 MANUALS, INFORMATION SYSTEMS, MONITORING, *METEOROLOGICAL SERVICES
 0064 " BIOGENIC HYDROCARBONS, ANALYTICAL TECHNIQUES, PETROLEUM PRODUCTS, *DISCRIMINATION
 0153 " GUIDELINES, DISPERSANTS, SPILL CLEANUP, SPILL RESPONSE
 0159 " GUIDELINES, CONTINGENCY PLANNING, SPILL CLEANUP, SPILL RESPONSE, PERSONNEL TRAINING
 0162 " GUIDELINES, DISPERSANTS, SPILL CLEANUP, SPILL RESPONSE
 0197 " CONTINGENCY PLANNING, BEAUFORT SEA, ARCTIC, SPILL CLEANUP, SPILL RESPONSE,
 SHORELINES
 0008 MARINE ENVIRONMENT, MONITORING, UK
 0010 " OIL SPILLS, SOURCE IDENTIFICATION
 0015 " MONITORING, *UNEP, *IGOSS PILOT PROJECT
 0016 " MONITORING, UN, *IOC/WMO WORKSHOP
 0017 " CONTAMINATION, BIOINDICATORS, MONITORING, MARINE ORGANISMS, PREDICTIONS
 0068 " HYDROCARBONS, DETECTION, SAMPLING, SOURCES, *ATMOSPHERIC INPUTS
 0074 " HYDROCARBONS, CONCENTRATIONS, CHEMICAL ANALYSIS, SEDIMENTS, *NATIONAL BUREAU OF
 STANDARDS
 0098 " HYDROCARBONS, BIODEGRADATION, BACTERIA, ATLANTIC OCEAN, SEDIMENTS, SEAWATER,
 *SCREENING
 0099 " CHEMICAL ANALYSIS, BIODEGRADATION, ANALYTICAL TECHNIQUES, OIL INDUSTRY
 0124 " GROUNDWATER, GC/MS, FRESHWATER, SOURCE IDENTIFICATION, PAH, SEDIMENTS
 0210 " LABRADOR SEA, CONTINGENCY PLANNING, CANADA, BASELINE STUDIES, ARCTIC, *INFORMATION
 ATLAS
 0236 " POLLUTION PREVENTION, POLLUTION CONTROL, UN
 0250 " INTERNATIONAL AGREEMENTS, POLLUTION CONTROL, *LAW OF THE SEA
 0251 " LABRADOR SEA, CONTINGENCY PLANNING, CANADA, BOOK REVIEW, BASELINE STUDIES, ARCTIC
 0329 " BIOLOGICAL EFFECTS, PETROLEUM PRODUCTS, MARINE ORGANISMS, MICROORGANISMS
 0367 " INDUSTRIES, CONTAMINATION, BENTHOS, WASTEWATERS
 0372 " LEGISLATION, DENMARK, BIOLOGICAL EFFECTS
 0437 " CANADA, BASELINE STUDIES, ARCTIC
 0454 " LEGISLATION, INTERNATIONAL AGREEMENTS, COASTAL WATERS, CANADA, POLLUTION CONTROL
 0466 " INDUSTRIES, ENVIRONMENTAL EFFECTS, BIOINDICATORS, MONITORING, OIL DISCHARGES, UK
 0472 " OIL SPILLS, UK, *ANNUAL REPORT - 1976
 0473 " OIL SPILLS, UK, *ANNUAL REPORT - 1977
 0480 " HEALTH HAZARDS, FISH, FATE, CRUDE OIL, COASTS, BIRDS, BIOLOGICAL EFFECTS,
 BEHAVIOR, BEACHES, MARINE ORGANISMS
 0481 " HYDROCARBONS, GUIDELINES, FATE, ENVIRONMENTAL EFFECTS, CHEMICAL ANALYSIS
 0484 " ESTUARIES, ENVIRONMENTAL EFFECTS, CONTAMINATION, BIOLOGICAL EFFECTS, OFFSHORE,
 MODELS, *PROCEEDINGS
 0488 " FISHERIES, DEVELOPMENT, OFFSHORE, OCS, NEW YORK
 0499 " ESTUARIES, ENVIRONMENTAL EFFECTS, BIBLIOGRAPHIES

0506 MARINE ENVIRONMENT, HYDROCARBONS, GULF OF MEXICO, CONCENTRATIONS, CHEMICAL ANALYSIS, SOURCES, TOXICITY, MARINE ORGANISMS, *VOLATILE LIQUID FRACTIONS
 0541 " HYDROCARBONS, CONTAMINATION, CHEMICAL ANALYSIS, *FLUOROMETRY
 0573 " FATE, ENVIRONMENTAL EFFECTS, COLD CLIMATES, PHYSICAL EFFECTS, SUBARCTIC REGIONS
 0578 " HYDROCARBONS, FATE, DISPERSION, SEAWATER, SEDIMENTS
 0588 " FATE, CHEMICAL EFFECTS, BIODEGRADATION, BEHAVIOR, PHYSICAL ASPECTS, WEATHERING, PETROLEUM PRODUCTS
 0590 " ENVIRONMENTAL EFFECTS, OIL SPILLS
 0615 " CHEMICAL ANALYSIS, NATURAL SEEPAGE, EXPLORATION
 0640 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, COASTAL WATERS, UN, SHIPS, OFFSHORE, *PROCEEDINGS
 0666 " TANKERS, *OLYMPIC BRAVERY SPILL
 0698 " EUROPE, DISPOSAL, REFINERIES, TOXICITY, WASTEWATER TREATMENT
 0733 " HYDROCARBONS, BIOMASS, BIOLOGICAL EFFECTS, PHYTOPLANKTON, *GULF EXPERIMENT
 0363 MARINE MAMMALS, MAINE, FISHERIES, BIRDS, REFINERIES
 0440 " BASELINE STUDIES, ALASKA, BIOLOGICAL EFFECTS, OCS, *SEA OTTER
 0446 " LABRADOR SEA, FISHERIES, FISH, BIRDS, BIOLOGICAL EFFECTS, BASELINE STUDIES, RESOURCE MANAGEMENT
 3017 MARINE ORGANISMS, MARINE ENVIRONMENT, CONTAMINATION, BIOINDICATORS, MONITORING, PREDICTIONS
 0018 " HYDROCARBONS, GREENLAND, SAMPLING, SEDIMENTS
 0055 " CRUDE OIL, BIOLOGICAL EFFECTS, SOLUTION, WSP, SEAWATER
 0097 " FISH, CHEMICAL ANALYSIS, PAH, MOLLUSKS
 0111 " DETECTION, ANALYTICAL TECHNIQUES, PAH, SEDIMENTS, SEAWATER
 0128 " HYDROCARBONS, DETECTION, BIOGENIC HYDROCARBONS, SOURCE IDENTIFICATION
 0245 " INTERNATIONAL AGREEMENTS, ECOSYSTEMS, POLLUTION CONTROL, RED SEA, MONITORING, OIL INDUSTRY, WASTEWATERS, *ALESCO
 0266 " PAH, MOLLUSKS, *ONCOGENIC PROPERTIES
 0275 " FUEL OIL, COASTS, BIRDS, OIL SPILLS, SCOTLAND
 0293 " INVERTEBRATES, FISH, COASTAL WATERS, BIOINDICATORS, BEHAVIOR, MONITORING
 0297 " BIODEGRADATION, AROMATIC HYDROCARBONS, TOXICITY, UPTAKE, METABOLISM
 0312 " FRANCE, DISTRIBUTION, COASTAL WATERS, BENTHOS, AMOCO CADIZ SPILL, MORTALITY, SUBLETHAL EFFECTS
 0313 " HYDROCARBONS, HABITATS, ECOSYSTEMS, BIOLOGICAL EFFECTS
 0316 " DISTRIBUTION, DEGRADATION, AQUATIC ENVIRONMENT, PAH, MOLLUSKS, UPTAKE
 0327 " HYDROCARBONS, BOOK REVIEW, TOXICITY, PETROLEUM PRODUCTS, METABOLISM, SUBLETHAL EFFECTS
 0329 " MARINE ENVIRONMENT, BIOLOGICAL EFFECTS, PETROLEUM PRODUCTS, MICROORGANISMS
 0330 " ECOSYSTEMS, BIOLOGICAL EFFECTS, PETROLEUM PRODUCTS
 0336 " HYDROCARBONS, CRUSTACEANS, BIOINDICATORS, ANNELIDS, UPTAKE, METABOLISM, MOLLUSKS, *OTOXIFICATION MECHANISMS
 0337 " FUEL OIL, AROMATIC HYDROCARBONS, TOXICITY, *AMPHIPODS, *ELASMUS PECTENICUS
 0339 " CRUDE OIL, AMOCO CADIZ SPILL, TOXICITY
 0343 " FUEL OIL, COASTAL WATERS, BALTIC SEA, ACUTE EFFECTS, *TSEIS SPILL
 0345 " ABSORPTION, SORPENTS, PRODUCT INFORMATION, PERFORMANCE TESTING, TOXICITY
 0356 " CONTAMINATION, CHRONIC EFFECTS, ACUTE EFFECTS, OIL SPILLS
 0368 " INVERTEBRATES, CRUDE OIL, CANADA, ARCTIC
 0369 " CRUDE OIL, BIOLOGICAL EFFECTS, ARCTIC
 0371 " IXTOC 1 BLOWOUT, INVERTEBRATES, GULF OF MEXICO, BIRDS, BIOLOGICAL EFFECTS
 0386 " DISTRIBUTION, BIOLOGICAL EFFECTS, BENTHOS, NATURAL SEEPAGE, MICROORGANISMS, SANTA BARBARA CHANNEL
 0398 " HYDROCARBONS, FATE, ACUTE EFFECTS, SUBLETHAL EFFECTS, ESTUARIES, REFINERIES, WASTEWATERS
 0426 " HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA, UPTAKE, SEDIMENTS, OCS
 0427 " HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA, UPTAKE, SEDIMENTS, OCS
 0428 " HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA, UPTAKE, SEDIMENTS, OCS
 0461 " HYDROCARBONS, CONTAMINATION, BOOK REVIEW, BIOLOGICAL EFFECTS
 0464 " HYDROCARBONS, CONCENTRATIONS, BENTHOS, WASTEWATERS, OIL FIELDS, SEDIMENTS, TEXAS, *BRINTS
 0473 " COASTAL WATERS, AMOCO CADIZ SPILL, PLANTS, SEDIMENTS, SHORELINES
 0480 " MARINE ENVIRONMENT, HEALTH HAZARDS, FISH, FATE, CRUDE OIL, COASTS, BIRDS, BIOLOGICAL EFFECTS, BEHAVIOR, BEACHES
 0493 " FRANCE, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, COASTS, AMOCO CADIZ SPILL, SAMPLING, *SPECIAL ISSUE
 0496 " CHEMICAL EFFECTS, CHEMICAL ANALYSIS, BIODEGRADATION, AMOCO CADIZ SPILL, OXIDATION
 0506 " MARINE ENVIRONMENT, HYDROCARBONS, GULF OF MEXICO, CONCENTRATIONS, CHEMICAL ANALYSIS, SOURCES, TOXICITY, *VOLATILE LIQUID FRACTIONS
 0514 " HYDROCARBONS, FATE, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, CONTAMINATION, NOAA
 0517 " CRUDE OIL, CANADA, BIODEGRADATION, ARCTIC, PLANTS
 0591 " FATE, AROMATIC HYDROCARBONS, METABOLISM, UPTAKE
 0609 " FISHERIES, ENVIRONMENTAL EFFECTS, DRILLING, CORAL REEFS, OFFSHORE, PLATFORMS, *DRILLING MUDS
 0612 " ESTUARIES, DRILLING, BIOLOGICAL EFFECTS, BENTHOS, TOXICITY, OFFSHORE, *BIOCIDES
 0616 " FOOD WEB, SEDIMENTS, SEDIMENTATION, OFFSHORE, PRODUCTION, UPTAKE, METABOLISM, *HEAVY METALS

0635 MARINE ORGANISMS, FISHERIES, FISH, ENVIRONMENTAL EFFECTS, CRUDE OIL, COST ANALYSIS, OIL INDUSTRY, SOCIOECONOMIC EFFECTS

0672 " FRANCE, ENVIRONMENTAL EFFECTS, COASTS, AMOCO CADIZ SPILL, TOXICITY, SPILL CLEANUP

0749 " HABITATS, DISTRIBUTION, COASTAL WATERS, CALIFORNIA, PLATFORMS, OFFSHORE

7287 MARSHES, GROWTH, CRUDE OIL, PLANTS, SEDIMENTS, *SPARTINA ALTERNIFLORA

0326 " CONTAMINATION, BIRDS, MORTALITY, TOXICITY, *PFSUSPENSION

0425 " FUEL OIL, FATE, ESTUARIES, RECOVERY, PLANTS, MASSACHUSETTS

0744 " ABSORPTION, SORRENENTS, VEGETATION, *OILY HYPERBICIDE SPILLS

0425 MASSACHUSETTS, MARSHES, FUEL OIL, FATE, ESTUARIES, RECOVERY, PLANTS

0060 MEDITERRANEAN SEA, HYDROCARBONS, CONCENTRATIONS, TANKERS, SAMPLING

0113 " HYDROCARBONS, CONCENTRATIONS, SAMPLING

0240 " OIL, SPILL RESPONSE, POLLUTION CONTROL

0360 " CRUSTACEANS, BIOLOGICAL EFFECTS, PORTS, PETROCHEMICALS, *BARNACLES

0739 " CONTAMINATION, BIBLIOGRAPHIES, MONITORING

0004 METABOLISM, CONTAMINATION, BIOINDICATORS, BIOASSAY, MONITORING

0067 " FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, *METABOLITES

0254 " HYDROCARBONS, FISH, UPTAKE, *TOLUENE, *BENZENE

0269 " FISH, PAH, *ENZYME ACTIVITY

0273 " FUEL OIL, FRESHWATER, CRUDE OIL, BENTHOS, BACTERIA, ALGAE, WASTE OIL, TOXICITY, *COMMUNITIES

0285 " DEPURATION, AROMATIC HYDROCARBONS, ANIMALS, UPTAKE, *RATS

0286 " FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, UPTAKE, *CORO SALMON, *NAPHTHALENE

0289 " CRUDE OIL, CONCENTRATIONS, BIOLOGICAL EFFECTS, ALGAE, TOXICITY

0292 " DEVELOPMENT, CONTAMINATION, CHRONIC EFFECTS, BIRDS, *USFWS, *PATUXENT WILDLIFE RESEARCH CENTER

0297 " MARINE ORGANISMS, BIODEGRADATION, AROMATIC HYDROCARBONS, TOXICITY, UPTAKE

0310 " HYDROCARBONS, BIRDS, *MALLARD DUCKS, *HYPOADRENOCORTICALISM

0317 " CRUDE OIL, AROMATIC HYDROCARBONS, PHYTOPLANKTON, TOXICITY

0323 " DEVELOPMENT, BIOLOGICAL EFFECTS, PETROLEUM PRODUCTS, *PORPHYRA

0324 " FISH, BIOLOGICAL EFFECTS, ACUTE EFFECTS, STATISTICAL ANALYSIS

0327 " MARINE ORGANISMS, HYDROCARBONS, BOOK REVIEW, TOXICITY, PETROLEUM PRODUCTS, SUBLETHAL EFFECTS

0328 " FISH, DEPURATION, AROMATIC HYDROCARBONS, UPTAKE, *PACIFIC HERRING, *BENZENE, *TOLUENE

0336 " MARINE ORGANISMS, HYDROCARBONS, CRUSTACEANS, BIOINDICATORS, ANNELIDS, UPTAKE, MOLLUSKS, *DETOXIFICATION MECHANISMS

0341 " FISH, AROMATIC HYDROCARBONS, TOXICITY, UPTAKE, *FUNDULUS HETEROCLETTIS, *NAPHTHALENE, *SALINITY

0344 " BIOLOGICAL EFFECTS, ARCTIC, VEGETATION, SOIL, *TUNDRA, *ROOTS, *SOIL CELLULOSE

0350 " FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, *METABOLITES

0355 " LAKES, CRUDE OIL, BIOMASS, ARCTIC, ALGAE, PLANKTON

0357 " BIOLOGICAL EFFECTS, MOLLUSKS, UPTAKE, *MYTILUS GALLPROVINCIALIS

0364 " HYDROCARBONS, FISH, UPTAKE, *SAITHE, *PHENANTHRENE

0366 " INVERTEBRATES, FISH, CRUSTACEANS, AROMATIC HYDROCARBONS, MOLLUSKS

0383 " FISH, AROMATIC HYDROCARBONS, UPTAKE, *RAINBOW TROUT, *PHENANTHRENE

0399 " FOOD WEB, CRUDE OIL, BIOLOGICAL EFFECTS, WSP, UPTAKE, *RETENTION

0447 " HYDROCARBONS, DEPURATION, CHRONIC EFFECTS, BASELINE STUDIES, ALASKA, ACUTE EFFECTS, TOXICITY, UPTAKE, ORGANISMS

0532 " FISH, BIOINDICATORS, BIODEGRADATION, MONITORING

0533 " HYDROCARBONS, BIODEGRADATION, AROMATIC HYDROCARBONS, MICROORGANISMS

0534 " HYDROCARBONS, BIODEGRADATION, OXIDATION, *ALKANES

0587 " ESTUARIES, COASTAL WATERS, BIODEGRADATION, PAH, UPTAKE, OXIDATION

0591 " MARINE ORGANISMS, FATE, AROMATIC HYDROCARBONS, UPTAKE

0605 " EXTRACTION, CONCENTRATIONS, BIOLOGICAL EFFECTS, OIL SHALE, WASTEWATERS

0606 " EXTRACTION, OIL SHALE, PRODUCTION, WASTEWATERS, TOXICITY, MAMMALS, *RATS

0616 " MARINE ORGANISMS, FOOD WEB, SEDIMENTS, SEDIMENTATION, OFFSHORE, PRODUCTION, UPTAKE, *HEAVY METALS

0750 " HYDROCARBONS, BACTERIA, UPTAKE, *CREOSOTE-TREATED PILINGS, *ISOPODS, *LINNORIA TRIPUNCTATA

0650 MEXICO, LITOC 1 BLOWOUT, CONTINGENCY PLANNING

0172 MICROORGANISMS, DISPERSANTS, BIODEGRADATION, SPILL REMOVAL, PATENT

0267 " FUEL OIL, CRUDE OIL, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS, ALGAE, TOXICITY, *DIATOMS

0298 " CONTAMINATION, BACTERIA, SEAWATER, *SURVIVAL

0307 " CRUDE OIL, BACTERIA, PETROLEUM PRODUCTS, UPTAKE, TOXICITY

0315 " EKOFISK BLOWOUT, NORTH SEA

0320 " HYDROCARBONS, UPTAKE, TOXICITY, *N-ALKANES, *DIATOMS

0329 " MARINE ORGANISMS, MARINE ENVIRONMENT, BIOLOGICAL EFFECTS, PETROLEUM PRODUCTS

0351 " DISPERSANTS, BIOLOGICAL EFFECTS, BACTERIA, STATISTICAL ANALYSIS, PRODUCT INFORMATION

0378 " CRUDE OIL, BIOLOGICAL EFFECTS, ARCTIC, SOIL, *DENITRIFICATION, *NITROGEN FIXATION

0386 " MARINE ORGANISMS, DISTRIBUTION, BIOLOGICAL EFFECTS, BENTHOS, NATURAL SEEPAGE, SANTA BARBARA CHANNEL

0393 " CONTAMINATION, BIOINDICATORS, BIODEGRADATION, BARENTS SEA, ARCTIC

0397 MICROORGANISMS, BIOLOGICAL EFFECTS, SEDIMENTS, *MICROBIAL ACTIVITY
 0429 " ENVIRONMENTAL EFFECTS, BASELINE STUDIES, ALASKA, DEVELOPMENTS, OCS
 0438 " CRUDE OIL, BIODEGRADATION, BEAUFORT SEA, BASELINE STUDIES, ALASKA, SEDIMENTS, OCS
 0463 " CRUDE OIL, CANADA, BIOLOGICAL EFFECTS, BIODEGRADATION, BEAUFORT SEA, BASELINE
 STUDIES, ARCTIC
 0491 " FISH, FATE, BIRDS, BIODEGRADATION, BEHAVIOR, AMOCO CADIZ SPILL, MONITORING,
 SEDIMENTS, SEAWATER, TOXICITY
 0515 " LAND FARMING, CHEMICAL EFFECTS, BIODEGRADATION, PHYSICAL ASPECTS, OXIDATION, SPILL
 CLEANUP, *STIMULATION
 0516 " CRUDE OIL, BIODEGRADATION, ARCTIC, *TUNDRA PONDS, *PHOSPHATE FERTILIZER ADDITION
 0518 " ENVIRONMENTAL EFFECTS, BIODEGRADATION, POLLUTION CONTROL, SPILL RESPONSE,
 *CONTAINED SPILLS
 0519 " FRESHWATER, CRUDE OIL, BIODEGRADATION, ARCTIC, RIVERS, *MUTAGENIC ACTIVITY
 0522 " BIODEGRADATION, *PSEUDOMONAS CITRONELLIS, *RECALCITRANT BRANCHED HYDROCARBONS
 0525 " COASTAL WATERS, BIODEGRADATION, BENTHOS, ANNELIDS, PAH, SEDIMENTS, *POLYCHAETE
 WORMS
 0533 " METABOLISM, HYDROCARBONS, BIODEGRADATION, AROMATIC HYDROCARBONS
 0535 " HYDROCARBONS, FUNGI, BIODEGRADATION, BACTERIA
 0536 " FATE, CRUDE OIL, BIOLOGICAL EFFECTS, BIODEGRADATION, ARCTIC, SOIL, *TUNDRA
 0537 " FRESHWATER, BIODEGRADATION, SAMPLING, PAH, *PHENANTHRENE
 0539 " ENVIRONMENTAL EFFECTS, BIODEGRADATION
 0540 " HYDROCARBONS, BIODEGRADATION, BACTERIA, OIL REMOVAL, *ENHANCED OIL RECOVERY
 0589 " FATE, DISPERSION, BIODEGRADATION, OIL SPILLS, SEA SURFACE, WEATHERING,
 SEDIMENTATION
 0432 MISSISSIPPI, FLORIDA, BASELINE STUDIES, ALABAMA, OCS, *MAPLA SURVEY
 0433 " FLORIDA, BASELINE STUDIES, ALABAMA, OCS, *MAPLA SURVEY
 0120 MODELS, INFORMATION SYSTEMS, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, OIL SPILLS,
 *PATTERN RECOGNITION
 0152 " GUIDELINES, BIBLIOGRAPHIES, SPILL CLEANUP, SPILL DISPOSAL
 0484 " MARINE ENVIRONMENT, ESTUARIES, ENVIRONMENTAL EFFECTS, CONTAMINATION, BIOLOGICAL
 EFFECTS, OFFSHORE, *PROCEEDINGS
 0554 " FATE, EPA, CONTAMINATION
 0555 " CONCENTRATIONS, PREDICTIONS, MOVEMENT, SPILL TRAJECTORIES, WEATHERING, SPREADING
 0576 " HYDROCARBONS, FATE, CONTAMINATION, ARGO MERCHANT SPILL, SEDIMENTS, TOXICITY
 0067 MOLLUSKS, DETECTION, CONCENTRATIONS, CHEMICAL ANALYSIS, PAH, *MUSSELS
 0072 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, *OYSTERS
 0088 " CONCENTRATIONS, CARCINOGENS, PAH, PETROLEUM PRODUCTS, UPTAKE, ORGANO, *MUSSELS
 0092 " HYDROCARBONS, FISH, CHEMICAL ANALYSIS, *SULFUR COMPOUNDS, *SUSPENSIONS
 0097 " MARINE ORGANISMS, FISH, CHEMICAL ANALYSIS, PAH
 0262 " HYDROCARBONS, BIOASSAY, UPTAKE, *CHRONIC POLLUTION, *MUSSELS
 0265 " ESTUARIES, CRUDE OIL, CONTAMINATION, CHRONIC EFFECTS, BIOASSAY, SEDIMENTS, *OYSTERS
 0266 " MARINE ORGANISMS, PAH, *ONCOGENIC PROPERTIES
 0268 " HYDROCARBONS, BIOLOGICAL EFFECTS, *MYTILUS EDULIS
 0280 " HYDROCARBONS, CONCENTRATIONS, CALIFORNIA, BIOLOGICAL EFFECTS, WSP, *BYSSAL TUBED
 FORMATION
 0282 " ESTUARIES, ECOSYSTEMS, CRUSTACEANS, CRUDE OIL, CHRONIC EFFECTS, SIMULATIONS,
 *OYSTERS, *SHRIMP, *ENZYME ACTIVITIES
 0291 " FISH, CRUSTACEANS, CONTAMINATION, CARCINOGENS, PAH, UPTAKE, *COMMERCIAL SEAFOODS,
 *CREOSOTE
 0316 " MARINE ORGANISMS, DISTRIBUTION, DEPURATION, AQUATIC ENVIRONMENT, PAH, UPTAKE
 0322 " GROWTH, FILTRATION, CRUDE OIL, CONTAMINATION, CASPIAN SEA, TOXICITY, USSR
 0336 " METABOLISM, MARINE ORGANISMS, HYDROCARBONS, CRUSTACEANS, BIOINDICATORS, ANNELIDS,
 UPTAKE, *DETOXIFICATION MECHANISMS
 0338 " GROWTH, DEVELOPMENT, CRUDE OIL, BIOLOGICAL EFFECTS, *MYTILUS EDULIS
 0354 " FRANCE, FISHERIES, FISH, CRUSTACEANS, CONTAMINATION, AMOCO CADIZ SPILL
 0357 " METABOLISM, BIOLOGICAL EFFECTS, UPTAKE, *MYTILUS GALLPROVINCIALIS
 0361 " FUEL OIL, ESTUARIES, DELAWARE, CRUDE OIL, CHRONIC EFFECTS, TOXICITY, MORTALITY,
 *CRASSOSTREA VIRGINICA
 0366 " METABOLISM, INVERTEBRATES, FISH, CRUSTACEANS, AROMATIC HYDROCARBONS
 0389 " DISPERSION, CRUDE OIL, SUBLETHAL EFFECTS, UPTAKE, *MACOMA BALTHICA
 0391 " GULF OF ALASKA, CALIFORNIA, PETROLEUM PRODUCTS, MORTALITY, TOXICITY, PACIFIC COAST
 0395 " FISHERIES, ECONOMICS, BIOINDICATORS, *LITTLENECK CLAMS
 0401 " MAINE, BIOLOGICAL EFFECTS, ATLANTIC COAST, *OIL SPILL SITES, *MYA ARENARIA,
 *METOPLASMS
 0583 " HYDROCARBONS, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, DISTRIBUTION,
 CONCENTRATIONS, NATURAL SEEPAGE
 0633 " FISHERIES, ESTUARIES, ENVIRONMENTAL EFFECTS, CHESAPEAKE BAY, BIOLOGICAL EFFECTS,
 REFINERIES, *OYSTERS
 0001 MONITORING, MANUALS, INFORMATION SYSTEMS, *METEOROLOGICAL SERVICES
 0004 " METABOLISM, CONTAMINATION, BIOINDICATORS, BIOASSAY
 0005 " LEAKAGE, EQUIPMENT, OIL DISCHARGES, PIPELINES, OIL TRANSFER, OIL TANKS
 0006 " HYDROCARBONS, CONTAMINATION, SHORELINES, *HONG KONG
 0007 " BIOINDICATORS, REFINERIES, WASTE OIL, WASTEWATERS
 0008 " MARINE ENVIRONMENT, UK
 0011 " ICE, EQUIPMENT, DRIFT, MOVEMENT, *TRACKING BUOYS

0012 MONITORING, ICE, EQUIPMENT, DRIFT, MOVEMENT, *TRACKING BUOYS
 0013 " OFFSHORE, PLATFORMS, OIL FIELDS, SANTA BARBARA CHANNEL, RISK ANALYSIS, *SEISMICITY
 0014 " COASTAL WATERS, NORWAY
 0015 " MARINE ENVIRONMENT, *UNEP, *IGOSS PILOT PROJECT
 0016 " MARINE ENVIRONMENT, UN, *IOC/WMO WORKSHOP
 0017 " MARINE ORGANISMS, MARINE ENVIRONMENT, CONTAMINATION, BIOINDICATORS, PREDICTIONS
 0025 " ENVIRONMENTAL EFFECTS, COASTS, SHORELINES, *ROCKY SHORES
 0026 " ICE, DETECTION, DESIGN-ENGINEERING, MOVEMENT, REMOTE SENSING, PERFORMANCE TESTING
 0033 " DETECTION, REMOTE SENSING, OIL SPILLS
 0040 " REMOTE SENSING, SURVEILLANCE, *KURDISTAN SPILL
 0041 " EQUIPMENT, REMOTE SENSING, *SPACE TECHNOLOGY
 0042 " DRIFT, DETECTION, REMOTE SENSING, MOVEMENT
 0043 " EQUIPMENT, DETECTION, REMOTE SENSING, PERFORMANCE TESTING, OIL SPILLS,
 *SCATTEROMETER, *RADAR
 0044 " ESTUARIES, DETECTION, BIBLIOGRAPHIES, REMOTE SENSING, POLLUTION CONTROL
 0050 " CONTAMINATION, REMOTE SENSING, SURVEILLANCE
 0065 " DISTRIBUTION, CONCENTRATIONS, AFRICA, TAR, SAMPLING
 0073 " AFRICA, SAMPLING, SPECTROMETRY, SEDIMENTS
 0093 " JAPAN, CONTAMINATION, SAMPLING, SEAWATER
 0129 " CRUDE OIL, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, NATURAL SEEPAGE, WEATHERING
 0230 " BLOWOUTS, SPILL RESPONSE
 0245 " MARINE ORGANISMS, INTERNATIONAL AGREEMENTS, ECOSYSTEMS, POLLUTION CONTROL, RED
 SEA, OIL INDUSTRY, WASTEWATERS, *ALESCO
 0293 " MARINE ORGANISMS, INVERTEBRATES, FISH, COASTAL WATERS, BIOINDICATORS, BEHAVIOR
 0448 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, BASELINE STUDIES, OIL SHALE, *COLORADO
 0466 " MARINE ENVIRONMENT, INDUSTRIES, ENVIRONMENTAL EFFECTS, BIOINDICATORS, OIL
 DISCHARGES, UK
 0487 " GROUNDWATER, EXPLORATION, DEVELOPMENT, DETECTION, CONTAMINATION, UK, *CONFERENCE
 0491 " MICROORGANISMS, FISH, FATE, BIRDS, BIODEGRADATION, BEHAVIOR, AMOCO CADIZ SPILL,
 SEDIMENTS, SEAWATER, TOXICITY
 0532 " METABOLISM, FISH, BIOINDICATORS, BIODEGRADATION
 0639 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, BASELINE STUDIES, OIL SHALE, PRODUCTION,
 *PROCEEDINGS
 0713 " WASTEWATERS, WASTE OIL, SOURCE IDENTIFICATION, *RARE EARTH TAGGING
 0720 " LAND FARMING, FUEL OIL, DISPOSAL, CRUDE OIL, CRANKCASE OIL, BIOLOGICAL EFFECTS,
 WASTE OIL, PLANTS, SOIL
 0739 " MEDITERRANEAN SEA, CONTAMINATION, BIBLIOGRAPHIES
 0263 MORTALITY, AROMATIC HYDROCARBONS, SUBLETHAL EFFECTS, *TOLUENE, *RESPIRATION, *MARINE
 ISOPODS
 0264 " FUEL OIL, BIRDS, TOXICITY, NORWAY, *BRUNNICH'S GUILLEMOTS
 0277 " FUEL OIL, CRUSTACEANS, CRUDE OIL, ARCTIC, *AMPHIPODS
 0279 " HARBORS, COASTAL WATERS, BIRDS, OIL SLICKS, UK
 0288 " HYDROCARBONS, CHRONIC EFFECTS, BIRDS, ANALYTICAL TECHNIQUES, ACUTE EFFECTS,
 TOXICITY, WILDLIFE
 0290 " CRUSTACEANS, BIOLOGICAL EFFECTS, WSP, TOXICITY
 0311 " CRUDE OIL, BIRDS, BIOLOGICAL EFFECTS, *HALLARD DUCKS, *COLD AND SEAWATER STRESS
 0312 " MARINE ORGANISMS, FRANCH, DISTRIBUTION, COASTAL WATERS, BENTHOS, AMOCO CADIZ
 SPILL, SUBLETHAL EFFECTS
 0318 " FRANCE, ENGLISH CHANNEL, BIRDS, AMOCO CADIZ SPILL
 0325 " FUEL OIL, BIRDS, REPRODUCTION, *LAUGHING GULLS
 0326 " MARSHES, CONTAMINATION, BIRDS, TOXICITY, *RESUSPENSION
 0334 " DEVELOPMENT, CRUSTACEANS, PAH, TOXICITY, *MUD CRABS, *NAPHTHALENE, *PHENANTHRENE,
 *SALINITY AND TEMPERATURE EFFECTS
 0352 " BIRDS, AMOCO CADIZ SPILL, UK, *AUKS
 0361 " MOLLUSKS, FUEL OIL, ESTUARIES, DELAWARE, CRUDE OIL, CHRONIC EFFECTS, TOXICITY,
 *CRASSOSTREA VIRGINICA
 0375 " BIRDS, TOXICITY, UK
 0379 " HYDROCARBONS, GROWTH, FISH, DEVELOPMENT, WSP, *FUNDULUS HETEROCLOTUS
 0391 " MOLLUSKS, GULF OF ALASKA, CALIFORNIA, PETROLEUM PRODUCTS, TOXICITY, PACIFIC COAST
 0602 " HEALTH HAZARDS, EXTRACTION, CARCINOGENS, OIL SHALE, OIL INDUSTRY, US, *SHALE OIL
 WORKERS
 0680 " LEAKAGE, DISPERSANTS, BIRDS, OIL TRANSFER, OIL SHALE
 0011 MOVEMENT, MONITORING, ICE, EQUIPMENT, DRIFT, *TRACKING BUOYS
 0012 " MONITORING, ICE, EQUIPMENT, DRIFT, *TRACKING BUOYS
 0026 " MONITORING, ICE, DETECTION, DESIGN-ENGINEERING, REMOTE SENSING, PERFORMANCE TESTING
 0042 " MONITORING, DRIFT, DETECTION, REMOTE SENSING
 0417 " FATE, BLOWOUTS, BEHAVIOR, PHYSICAL ASPECTS, SEAWATER, SEA SURFACE
 0434 " ICE, FATE, COLD CLIMATES, BEHAVIOR, BASELINE STUDIES, ALASKA, PHYSICAL EFFECTS,
 SPREADING
 0441 " ICE, BEHAVIOR, BASELINE STUDIES, ALASKA, OCS, *OIL POOLING
 0443 " LABRADOR SEA, ENVIRONMENTAL EFFECTS, DRILLING, CANADA, BASELINE STUDIES, SPILL
 RESPONSE, PREDICTIONS, OCS, *TRAJECTORIES, *NEWFOUNDLAND
 0543 " HYDROCARBONS, FATE, ATLANTIC OCEAN, PETROLEUM PRODUCTS, SEDIMENTS, *NEW YORK BIGHT
 0547 " DRIFT, BEHAVIOR, PHYSICAL ASPECTS, OIL SLICKS, *WAVE AND WIND ACTION
 0552 " BEHAVIOR, PHYSICAL EFFECTS, OIL SLICKS

0553 MOVEMENT, ICE, CRUDE OIL, BEHAVIOR, OIL SLICKS, *CURRENTS, *OIL-UNDER-ICE
 0555 " MODELS, CONCENTRATIONS, PREDICTIONS, SPILL TRAJECTORIES, WEATHERING, SPREADING
 0558 " IXTOC 1 BLOWOUT, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, DRIFT, BEHAVIOR, OIL SLICKS
 0564 " PREDICTIONS, SPILL TRAJECTORIES
 0586 " FATE, EKOFISK BLOWOUT, BEHAVIOR, NORTH SEA, OIL SLICKS
 0278 MUTAGENS, FUEL OIL, OXIDATION, TOXICITY, YEASTS, *PHOTOPRODUCTS
 0396 " CRUDE OIL, ALGAE, PETROLEUM PRODUCTS, TOXICITY, *CHLAMYDOMONAS PEINHARDTII
 0603 " HEALTH HAZARDS, EXTRACTION, CRUDE OIL, PAH, WASTEWATERS, OIL SHALE
 0607 " CRUDE OIL, CARCINOGENS, PAH, OIL SHALE, OIL INDUSTRY
 0127 NARRAGANSETT BAY, ESTUARIES, DISTRIBUTION, SOURCE IDENTIFICATION, PAH, SEDIMENTS
 0045 NATURAL SEEPAGE, DETECTION, COASTAL WATERS, CANADA, ARCTIC, REMOTE SENSING
 0114 " SOURCE IDENTIFICATION, STATISTICS, TANKERS, OFFSHORE, INLAND, OIL INDUSTRY
 0129 " MONITORING, CRUDE OIL, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, WEATHERING
 0386 " MICROORGANISMS, MARINE ORGANISMS, DISTRIBUTION, BIOLOGICAL EFFECTS, BENTHOS, SANTA
 BARBARA CHANNEL
 0504 " CRUDE OIL, ATLANTIC OCEAN, NOAA
 0571 " HYDROCARBONS, GULF OF MEXICO, CHEMICAL ANALYSIS, TAR, SAMPLING
 0579 " HYDROCARBONS, FATE, ALASKA
 0583 " MOLLUSKS, HYDROCARBONS, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, DISTRIBUTION,
 CONCENTRATIONS
 0584 " HYDROCARBONS, GULF OF MEXICO, FATE, CARIBBEAN SEA, BIOLOGICAL EFFECTS
 0595 " CALIFORNIA, TAR, SANTA BARBARA CHANNEL, OFFSHORE, ONSHORE, *ASPHALT DEPOSITS
 0615 " MARINE ENVIRONMENT, CHEMICAL ANALYSIS, EXPOSITION
 0202 NEW JERSEY, GUIDELINES, CONTINGENCY PLANNING, SPILL RESPONSE, NEW YORK
 0424 " LAND FARMING, RESTORATION, SOIL, ONSHORE, RECLAMATION, OIL SPILLS
 0694 " FISHERIES, SHIPS, OIL SPILLS, *TOURISM
 0194 NEW YORK, HARBORS, BAYS, SHIPS, OIL SPILLS, SPILL CLEANUP
 0202 " NEW JERSEY, GUIDELINES, CONTINGENCY PLANNING, SPILL RESPONSE
 0498 " MARINE ENVIRONMENT, FISHERIES, DEVELOPMENT, OFFSHORE, OCS
 0504 NOAA, NATURAL SEEPAGE, CRUDE OIL, ATLANTIC OCEAN
 0514 " MARINE ORGANISMS, HYDROCARBONS, FATE, ENVIRONMENTAL EFFECTS, ECOSYSTEMS,
 CONTAMINATION
 0524 NORTH CAROLINA, FRESHWATER, ESTUARIES, COASTS, BIODEGRADATION, BACTERIA
 0071 NORTH SEA, HYDROCARBONS, EKOFISK BLOWOUT, DETECTION, CONCENTRATIONS, SEAWATER,
 SAMPLING
 0253 " CONTINGENCY PLANNING, POLLUTION PREVENTION, RISK ANALYSIS, SAFETY, NORWAY
 0271 " FISH, EKOFISK BLOWOUT, BIOLOGICAL EFFECTS, ZOOPLANKTON, *EGGS AND LARVAE
 0315 " MICROORGANISMS, EKOFISK BLOWOUT
 0331 " FISH, EKOFISK BLOWOUT
 0332 " EKOFISK BLOWOUT, BIOLOGICAL EFFECTS, PLANKTON
 0333 " BIOLOGICAL EFFECTS, OIL SPILLS, PLANKTON
 0370 " EKOFISK BLOWOUT, PHYTOPLANKTON, PRODUCTION, *RESEARCH REVIEW
 0410 " FATE, EKOFISK BLOWOUT, DISTRIBUTION, BEHAVIOR, OIL SLICKS
 0459 " FISH, ENVIRONMENTAL EFFECTS, EKOFISK BLOWOUT, PLANKTON
 0489 " ENVIRONMENTAL EFFECTS, EKOFISK BLOWOUT, OIL SLICKS
 0492 " FATE, ENVIRONMENTAL EFFECTS, *EKOFISK BLOWOUT, BEHAVIOR, *RESEARCH REVIEW
 0494 " EKOFISK BLOWOUT, *RESEARCH REVIEW
 0531 " FUNGI, EKOFISK BLOWOUT, BIODEGRADATION, BACTERIA
 0550 " EKOFISK BLOWOUT, DRIFT, BEHAVIOR, PHYSICAL ASPECTS
 0575 " FATE, EKOFISK BLOWOUT, CRUDE OIL, OIL SLICKS, WEATHERING
 0580 " FATE, CRUDE OIL, BEHAVIOR, OIL DISCHARGES, OFFSHORE, PRODUCTION, OIL FIELDS
 0581 " FATE, EKOFISK BLOWOUT, CRUDE OIL, BLOWOUTS, BEHAVIOR, OIL DISCHARGES, OFFSHORE
 0586 " MOVEMENT, FATE, EKOFISK BLOWOUT, BEHAVIOR, OIL SLICKS
 0623 " INTERNATIONAL AGREEMENTS, EKOFISK BLOWOUT, AMOCO CADIZ SPILL, REGULATIONS,
 OFFSHORE, PRODUCTION
 0630 " GOVERNMENT AGENCIES, *EKOFISK BLOWOUT, NORWAY
 0641 " FISHERIES, EXPLORATION, DRILLING, OIL INDUSTRY, PLATFORMS, OFFSHORE, NORWAY
 0014 NORWAY, MONITORING, COASTAL WATERS
 0253 " NORTH SEA, CONTINGENCY PLANNING, POLLUTION PREVENTION, RISK ANALYSIS, SAFETY
 0264 " MORTALITY, FUEL OIL, BIRDS, TOXICITY, *BRUNNICH'S GUILLEMOTS
 0387 " CRUDE OIL, CONTAMINATION, REPRODUCTION, *GASTROPODS, *LITTORINA LITTOREA
 0490 " CONTAMINATION, BENTHOS, ALGAE, *OSLO FJORD
 0574 " FATE, BEHAVIOR, OIL SPILLS, OCS
 0630 " NORTH SEA, GOVERNMENT AGENCIES, EKOFISK BLOWOUT
 0641 " NORTH SEA, FISHERIES, EXPLORATION, DRILLING, OIL INDUSTRY, PLATFORMS, OFFSHORE
 0056 OCS, HYDROCARBONS, CHEMICAL ANALYSIS, ATLANTIC COAST, SAMPLING, PAH, SEDIMENTS
 0260 " GROWTH, CRUDE OIL, CHRONIC EFFECTS, BENTHOS, BACTERIA, ACUTE EFFECTS, TEXAS
 0426 " MARINE ORGANISMS, HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA, UPTAKE,
 SEDIMENTS
 0427 " MARINE ORGANISMS, HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA, UPTAKE,
 SEDIMENTS
 0428 " MARINE ORGANISMS, HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA, UPTAKE,
 SEDIMENTS
 0429 " MICROORGANISMS, ENVIRONMENTAL EFFECTS, BASELINE STUDIES, ALASKA, DEVELOPMENTS
 0430 " BIOMASS, BIOINDICATORS, BENTHOS, BASELINE STUDIES, ALASKA, SEDIMENTS

0432 OCS, MISSISSIPPI, FLORIDA, BASELINE STUDIES, ALABAMA, *NAFLA SURVEY
 0433 " MISSISSIPPI, FLORIDA, BASELINE STUDIES, ALABAMA, *NAFLA SURVEY
 0435 " HYDROCARBONS, FATE, ALASKA, ADSORPTION, PHYSICAL EFFECTS, *SUSPENDED MATTER
 0438 " MICROORGANISMS, CRUDE OIL, BIODEGRADATION, BEAUFORT SEA, BASELINE STUDIES, ALASKA
 , SEDIMENTS
 0440 " MARINE MAMMALS, BASELINE STUDIES, ALASKA, BIOLOGICAL EFFECTS, *SEA OTTER
 0441 " MOVEMENT, ICE, BEHAVIOR, BASELINE STUDIES, ALASKA, *OIL POOLING
 0442 " HYDROCARBONS, BASELINE STUDIES, ALASKA, SUBLETHAL EFFECTS, *TRACE METALS,
 *BIOTRANSFORMATIONS
 0443 " MOVEMENT, LABRADOR SEA, ENVIRONMENTAL EFFECTS, DRILLING, CANADA, BASELINE STUDIES,
 SPILL RESPONSE, PREDICTIONS, *TRAJECTORIES, *NEWFOUNDLAND
 0444 " LABRADOR SEA, ENVIRONMENTAL EFFECTS, DRILLING, CANADA, BLOWOUTS, BASELINE STUDIES,
 *NEWFOUNDLAND
 0445 " LABRADOR SEA, ENVIRONMENTAL EFFECTS, CANADA, BLOWOUTS, BASELINE STUDIES,
 *BIOLOGICAL DESCRIPTIONS
 0450 " ENVIRONMENTAL EFFECTS, DEVELOPMENT, CONTAMINATION, BASELINE STUDIES, ALASKA
 0468 " HABITATS, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, OFFSHORE, PRODUCTION, PLATFORMS,
 TEXAS, *BUCCANEER OIL FIELD
 0488 " NEW YORK, MARINE ENVIRONMENT, FISHERIES, DEVELOPMENT, OFFSHORE
 0566 " GULF OF ALASKA, RISK ANALYSIS, OIL SPILLS, OIL-GAS LEASING
 0568 " ATLANTIC COAST, PREDICTIONS, SEDIMENTS, OIL SPILLS, RISK ANALYSIS, SANTA BARBARA
 CHANNEL
 0574 " NORWAY, FATE, BEHAVIOR, OIL SPILLS
 0624 " HABITATS, GEORGES BANK, FISHERIES, DRILLING, DEVELOPMENT, ATLANTIC COAST, RESOURCE
 MANAGEMENT
 0625 " LEGISLATION, RIS, OIL INDUSTRY, OFFSHORE, POLLUTION CONTROL, US
 0626 " LEGISLATION, GUIDELINES, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OFFSHORE, POLLUTION
 CONTROL
 0627 " LEGISLATION, GOVERNMENT AGENCIES, OIL-GAS LEASING, US
 0631 " BLOWOUTS, OFFSHORE, PLATFORMS, PRODUCTION, STATISTICS
 0643 " ESTUARIES, DEVELOPMENT, COASTS, ALASKA, OIL DISCHARGES, OFFSHORE, OREGON,
 WASHINGTON, PACIFIC COAST
 0648 " FISHERIES, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, OFFSHORE,
 PRODUCTION, RESOURCE MANAGEMENT, SANTA BARBARA CHANNEL
 0649 " LOUISIANA, GULF OF MEXICO, FISHERIES, ENVIRONMENTAL EFFECTS, OFFSHORE, OIL
 INDUSTRY, SOCIOECONOMIC EFFECTS
 0659 " FISHERIES, DEVELOPMENT, ATLANTIC COAST, RISK ANALYSIS
 0695 " DEVELOPMENT, SHIPS, TANKERS, PRODUCTION, OIL TRANSPORT, PORTS, SANTA BARBARA
 CHANNEL, PACIFIC COAST
 0745 " DEVELOPMENT, ATLANTIC COAST, ALASKA, OFFSHORE, SAFETY, RISK ANALYSIS, PACIFIC
 COAST, US, *ENVIRONMENTAL HAZARDS
 0013 OFFSHORE, MONITORING, PLATFORMS, OIL FIELDS, SANTA BARBARA CHANNEL, RISK ANALYSIS,
 *SEISMICITY
 0114 " NATURAL SEEPAGE, SOURCE IDENTIFICATION, STATISTICS, TANKERS, INLAND, OIL INDUSTRY
 0196 " DRILLING, CONTINGENCY PLANNING, CANADA, BLOWOUTS, ARCTIC, SPILL RESPONSE
 0201 " CONTINGENCY PLANNING, CANADA, BLOWOUTS, ARCTIC, PREDICTIONS
 0205 " LABRADOR SEA, GOVERNMENT AGENCIES, EXPLOATION, EQUIPMENT, CONTINGENCY PLANNING,
 CANADA, PREDICTIONS, SPILL RESPONSE, OIL INDUSTRY
 0235 " CONTINGENCY PLANNING, STATISTICS, SOURCES, SPILL RESPONSE, TANKERS, *USFWS
 0241 " LOUISIANA, BLOWOUTS, POLLUTION CONTROL, PRODUCTION, PLATFORMS
 0436 " EXPLORATION, CONTAMINATION, BIRDS, BEACHES, BASELINE STUDIES, ATLANTIC COAST
 0449 " FISHERIES, DEVELOPMENT, COASTS, BEAUFORT SEA, BASELINE STUDIES, ALASKA, WILDLIFE
 0457 " LIABILITY, DEVELOPMENT, COMPENSATION, ONSHORE, SOURCES, RIVERS, POLLUTION CONTROL,
 US, *UNEP CONVENTION
 0460 " IXTOC 1 BLOWOUT, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, PERSONNEL TRAINING,
 REGULATIONS
 0463 " OCS, HABITATS, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, PRODUCTION, PLATFORMS, TEXAS,
 *BUCCANEER OIL FIELD
 0484 " MODELS, MARINE ENVIRONMENT, ESTUARIES, ENVIRONMENTAL EFFECTS, CONTAMINATION,
 BIOLOGICAL EFFECTS, *PROCEEDINGS
 0498 " OCS, NEW YORK, MARINE ENVIRONMENT, FISHERIES, DEVELOPMENT
 0523 " GULF OF MEXICO, BIODEGRADATION, BACTERIA, OIL FIELDS, *BACTERIOLOGICAL ASPECTS
 0577 " FATE, BEHAVIOR
 0580 " NORTH SEA, FATE, CRUDE OIL, BEHAVIOR, OIL DISCHARGES, PRODUCTION, OIL FIELDS
 0581 " NORTH SEA, FATE, EKOFISK BLOWOUT, CRUDE OIL, BLOWOUTS, BEHAVIOR, OIL DISCHARGES
 0595 " NATURAL SEEPAGE, CALIFORNIA, TAZ, SANTA BARBARA CHANNEL, ONSHORE, *ASPHALT DEPOSITS
 0609 " MARINE ORGANISMS, FISHERIES, ENVIRONMENTAL EFFECTS, DRILLING, CORAL REEFS,
 PLATFORMS, *DRILLING MUDS
 0612 " MARINE ORGANISMS, ESTUARIES, DRILLING, BIOLOGICAL EFFECTS, BENTHOS, TOXICITY,
 *BIOCIDES
 0614 " EXPLORATION, DRILLING, CHEMICAL EFFECTS, CHEMICAL ANALYSIS, CANADA, ARCTIC,
 TOXICITY, WASTEWATER DISPOSAL, *DRILLING MUDS
 0616 " METABOLISM, MARINE ORGANISMS, FOOD WEB, SEDIMENTS, SEDIMENTATION, PRODUCTION,
 UPTAKE, *HEAVY METALS

0619 OFFSHORE, GULF OF MEXICO, EXPLORATION, ECONOMIC EFFECTS, ATLANTIC COAST, PRODUCTION,
WATER QUALITY

0620 " EXPLORATION, ECONOMICS, DRILLING, CANADA, SOCIOECONOMIC EFFECTS

0621 " LEGISLATION, ATLANTIC COAST, OIL-GAS LEASING

0622 " LIABILITY, INTERNATIONAL CONVENTIONS, EXPLORATION, REGULATIONS, OIL INDUSTRY

0623 " NORTH SEA, INTERNATIONAL AGREEMENTS, EKOFISK BLOWOUT, AMOCO CADIZ SPILL,
REGULATIONS, PRODUCTION

0625 " OCS, LEGISLATION, EIS, OIL INDUSTRY, POLLUTION CONTROL, US

0626 " OCS, LEGISLATION, GUIDELINES, ENVIRONMENTAL EFFECTS, DEVELOPMENT, POLLUTION CONTROL

0629 " IXTOC 1 BLOWOUT, GULF OF MEXICO, DRILLING

0631 " OCS, BLOWOUTS, PLATFORMS, PRODUCTION, STATISTICS

0638 " DEVELOPMENT, BLOWOUTS, OIL INDUSTRY, PRODUCTION, PLATFORMS, SPILL RESPONSE, SPILL
CLEANUP, SAFETY

0640 " MARINE ENVIRONMENT, ENVIRONMENTAL EFFECTS, DEVELOPMENT, COASTAL WATERS, US, SHIPS,
*PROCEEDINGS

0641 " NORWAY, NORTH SEA, FISHERIES, EXPLORATION, DRILLING, OIL INDUSTRY, PLATFORMS

0642 " OCS, ESTUARIES, DEVELOPMENT, COASTS, ALASKA, OIL DISCHARGES, OREGON, WASHINGTON,
PACIFIC COAST

0645 " FISHERIES, ENVIRONMENTAL EFFECTS, ECONOMICS, US, PRODUCTION

0647 " LOUISIANA, ESTUARIES, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, DRILLING, PRODUCTION

0649 " OCS, FISHERIES, ENVIRONMENTAL EFFECTS, DEVELOPMENT, OIL-GAS LEASING, PRODUCTION,
RESOURCE MANAGEMENT, SANTA BARBARA CHANNEL

0649 " OCS, LOUISIANA, GULF OF MEXICO, FISHERIES, ENVIRONMENTAL EFFECTS, OIL INDUSTRY,
SOCIOECONOMIC EFFECTS

0651 " LOUISIANA, EXPLORATION, ECOSYSTEMS, ECONOMICS, DEVELOPMENT, COASTAL WATERS,
RESOURCE MANAGEMENT

0654 " GEORGES BANK, FISHERIES, DRILLING, OIL-GAS LEASING, US GOVERNMENT

0691 " INFORMATION SYSTEMS, FRANCE, DRILLING, TANKERS, SHIPS, OIL SPILLS, SOURCES, *DATA
BANK, *ACCIDENTS

0745 " OCS, DEVELOPMENT, ATLANTIC COAST, ALASKA, SAFETY, RISK ANALYSIS, PACIFIC COAST,
US, *ENVIRONMENTAL HAZARDS

0749 " MARINE ORGANISMS, HABITATS, DISTRIBUTION, COASTAL WATERS, CALIFORNIA, PLATFORMS

0005 OIL DISCHARGES, MONITORING, LEAKAGE, EQUIPMENT, PIPELINES, OIL TRANSFER, OIL TANKS

0119 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, TANKERS, OIL SPILLS,
SAMPLING, TAR

0126 " INDUSTRIES, HYDROCARBONS, ESTUARIES, SOURCE IDENTIFICATION, US, *VOLATILE
FRACTIONS

0239 " BIRDS, BALLAST, SPILL RESPONSE, POLLUTION CONTROL, TANKERS, SPILL COOPERATIVES,
OIL INDUSTRY

0243 " INDUSTRIES, CALIFORNIA, POLLUTION CONTROL, REGULATIONS, WASTEWATERS

0455 " LIABILITY, LEGISLATION, REGULATIONS, US

0466 " MONITORING, MARINE ENVIRONMENT, INDUSTRIES, ENVIRONMENTAL EFFECTS, BIOINDICATORS,
UK

0502 " LEAKAGE, INDUSTRIES, GROUNDWATER, DISPOSAL, CONTAMINATION, WASTEWATERS

0507 " FINLAND, COASTAL WATERS, BIRDS

0580 " OFFSHORE, NORTH SEA, FATE, CRUDE OIL, BEHAVIOR, PRODUCTION, OIL FIELDS

0581 " OFFSHORE, NORTH SEA, FATE, EKOFISK BLOWOUT, CRUDE OIL, BLOWOUTS, BEHAVIOR

0643 " OFFSHORE, OCS, ESTUARIES, DEVELOPMENT, COASTS, ALASKA, OREGON, WASHINGTON,
PACIFIC COAST

0665 " INTERNATIONAL AGREEMENTS, EQUIPMENT, OIL TRANSPORT, TANKERS, POLLUTION CONTROL,
PERSONNEL TRAINING, *SUBSTANDARD SHIPS

0668 " INTERNATIONAL AGREEMENTS, IMCO, TANKERS, OIL SPILLS, *PROCEEDINGS

0670 " DESIGN-ENGINEERING, TANKERS, SEGREGATED BALLAST, POLLUTION PREVENTION, SAFETY

0685 " BALLAST, TANKERS, POLLUTION CONTROL, SEGREGATED BALLAST, PORTS, *LOAD ON TOP
METHOD

0013 OIL FIELDS, OFFSHORE, MONITORING, PLATFORMS, SANTA BARBARA CHANNEL, RISK ANALYSIS,
*SEISMICITY

0464 " MARINE ORGANISMS, HYDROCARBONS, CONCENTRATIONS, BENTHOS, WASTEWATERS, SEDIMENTS,
TEXAS, *BRINES

0523 " OFFSHORE, GULF OF MEXICO, BIODEGRADATION, BACTERIA, *BACTERIOLOGICAL ASPECTS

0590 " OIL DISCHARGES, OFFSHORE, NORTH SEA, FATE, CRUDE OIL, BEHAVIOR, PRODUCTION

0618 " WASTE OIL, REFINERIES, WASTEWATERS, REUSE, WATER QUALITY, SOCIOECONOMIC EFFECTS,
*BAVARIA, *BEER, *TOURISM

0658 " LAKES, GROUNDWATER, ENVIRONMENTAL EFFECTS, DISPOSAL, WASTEWATERS, OIL WELLS,
ONSHORE, OIL INDUSTRY, WILDLIFE, *PLAYAS

0566 OIL-GAS LEASING, OCS, GULF OF ALASKA, RISK ANALYSIS, OIL SPILLS

0621 " OFFSHORE, LEGISLATION, ATLANTIC COAST

0627 " OCS, LEGISLATION, GOVERNMENT AGENCIES, US

0648 " OFFSHORE, OCS, FISHERIES, ENVIRONMENTAL EFFECTS, DEVELOPMENT, PRODUCTION, RESOURCE
MANAGEMENT, SANTA BARBARA CHANNEL

0654 " OFFSHORE, GEORGES BANK, FISHERIES, DRILLING, US GOVERNMENT

0655 " ENVIRONMENTAL EFFECTS, COLD CLIMATES, ALASKA, US GOVERNMENT, SPILL RESPONSE

0096 OIL INDUSTRY, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, PAR

0099 " MARINE ENVIRONMENT, CHEMICAL ANALYSIS, BIODEGRADATION, ANALYTICAL TECHNIQUES

0105 " LAKES, CONCENTRATIONS, SAMPLING, OIL SHALE, WASTEWATERS, USSR, RIVERS, *ESTONIA

0114 OIL INDUSTRY, OFFSHORE, NATURAL SEEPAGE, SOURCE IDENTIFICATION, STATISTICS, TANKERS, INLAND

0145 " LEGISLATION, ECONOMICS, US GOVERNMENT, SPILL CLEANUP

0190 " EQUIPMENT, DISPERSANTS, CALIFORNIA, PERSONNEL TRAINING, PERFORMANCE TESTING, SPILL CLEANUP, JSCC

0205 " OFFSHORE, LABRADOR SEA, GOVERNMENT AGENCIES, EXPLORATION, EQUIPMENT, CONTINGENCY PLANNING, CANADA, PREDICTIONS, SPILL RESPONSE

0211 " EQUIPMENT, CONTINGENCY PLANNING, CANADA, SPILL RESPONSE, ONSHORE, *PRAIRIES

0239 " OIL DISCHARGES, BIRDS, BALLAST, SPILL RESPONSE, POLLUTION CONTROL, TANKERS, SPILL COOPERATIVES

0244 " LEGISLATION, INTERNATIONAL CONVENTIONS, REGULATIONS, US, POLLUTION CONTROL, *NAVIGATION AIDS

0245 " MONITORING, MARINE ORGANISMS, INTERNATIONAL AGREEMENTS, ECOSYSTEMS, POLLUTION CONTROL, RED SEA, WASTEWATERS, *ALESCO

0562 " ICT, PATS, BEHAVIOR, SIMULATIONS, *PACK ICT, *APOA

0602 " MORTALITY, HEALTH HAZARDS, EXTRACTION, CARCINOGENS, OIL SHALE, US, *SHALE OIL WORKERS

0607 " MUTAGENS, CRUDE OIL, CARCINOGENS, PAH, OIL SHALE

0608 " EXTRACTION, CHRONIC EFFECTS, CARCINOGENS, OIL SHALE, USSR, *CANCER INCIDENCE, *ESTONIA

0622 " OFFSHORE, LIABILITY, INTERNATIONAL CONVENTIONS, EXPLORATION, REGULATIONS

0625 " OFFSHORE, OCS, LEGISLATION, EIS, POLLUTION CONTROL, US

0628 " HABITATS, ENVIRONMENTAL EFFECTS, ALASKA, WILDLIFE

0635 " MARINE ORGANISMS, FISHERIES, FISH, ENVIRONMENTAL EFFECTS, CRUDE OIL, COST ANALYSIS, SOCIOECONOMIC EFFECTS

0638 " OFFSHORE, DEVELOPMENT, BLOWOUTS, PRODUCTION, PLATFORMS, SPILL RESPONSE, SPILL CLEANUP, SAFETY

0641 " OFFSHORE, NORWAY, NORTH SEA, FISHERIES, EXPLORATION, DRILLING, PLATFORMS

0649 " OFFSHORE, OCS, LOUISIANA, GULF OF MEXICO, FISHERIES, ENVIRONMENTAL EFFECTS, SOCIOECONOMIC EFFECTS

0658 " OIL WELLS, LAKES, GROUNDWATER, ENVIRONMENTAL EFFECTS, DISPOSAL, WASTEWATERS, OIL WELLS, ONSHORE, WILDLIFE, *PLAYAC

0672 " DISPERSANTS, CARIBBEAN SEA, SPILL RESPONSE, TANKERS, *ARGENT CAPTAIN SPILL, *ATLANTIC EXPRESS SPILL

0677 " SUBOFT, PIPELINES, STATISTICS, OIL SPILLS, SPILL REMOVAL

0142 OIL REMOVAL, SPILL CLEANUP, OIL-WATER SEPARATION, PRODUCT INFORMATION

0148 " ABSORPTION, SORBENTS, PATENT, *CCIR DJST

0191 " EQUIPMENT, CONTINGENCY PLANNING, PERSONNEL TRAINING, SPILL CLEANUP

0214 " CONTINGENCY PLANNING, AMOCO CADIZ SPILL, TANKERS, OIL TANKS, STORAGE, OIL TRANSFER

0233 " GROUNDWATER, DISPOSAL, CONTAMINATION, OIL SPILLS, POLLUTION PREVENTION, RECOVERY, RESTORATION

0479 " BURNING, BEAUFORT SEA, ARCTIC, OIL SPILLS, POLLUTION CONTROL

0540 " MICROORGANISMS, HYDROCARBONS, BIODEGRADATION, BACTERIA, *ENHANCED OIL RECOVERY

0544 " EMULSIFICATION, OIL-WATER SEPARATION, PHYSICAL ASPECTS

0700 " CONTAMINATION, COALESCENCE, WASTEWATER TREATMENT, OIL-WATER SEPARATION, PATENT

0704 " REFINERIES, WASTEWATER TREATMENT, OIL-WATER SEPARATION

0716 " EMULSIONS, CONTAMINATION, ABSORPTION, WASTEWATER TREATMENT

0722 " INDUSTRIES, WASTEWATER TREATMENT, *ULTRAFILTRATION, *REVERSE OSMOSIS

0726 " INDUSTRIES, BIOLOGICAL TREATMENT, WASTEWATER TREATMENT, SLUDGE

0727 " OIL-WATER SEPARATION, SORBENTS, PATENT

0729 " FILTRATION, COALESCENCE, OIL-WATER SEPARATION, SORBENTS, PRODUCT INFORMATION, *MODIFIED PEAT

0105 OIL SHALE, OIL INDUSTRY, LAKES, CONCENTRATIONS, SAMPLING, WASTEWATERS, USSR, RIVERS, *ESTONIA

0448 " MONITORING, ENVIRONMENTAL EFFECTS, DEVELOPMENT, BASELINE STUDIES, *COLORADO

0598 " FISH, EXTRACTION, WASTEWATERS, TOXICITY, *RAINBOW TROUT, *PATERAD MINNOWS

0599 " HEALTH HAZARDS, FOSSIL WELLS, CRUDE OIL, CARCINOGENS, BIOASSAY, AROMATIC HYDROCARBONS, *PNA

0600 " HEALTH HAZARDS, CRUDE OIL, CARCINOGENS, PETROLEUM PRODUCTS, TAR, USSR, *BENZO(a)PYRENE, *ESTONIA

0601 " HEALTH HAZARDS, EXTRACTION, CARCINOGENS, TAR, WASTEWATERS, USSR, *PHENOLS, *PTOXIA

0602 " OIL INDUSTRY, MORTALITY, HEALTH HAZARDS, EXTRACTION, CARCINOGENS, US, *SHALE OIL WORKERS

0603 " MUTAGENS, HEALTH HAZARDS, EXTRACTION, CRUDE OIL, PAH, WASTEWATERS

0605 " METABOLISM, EXTRACTION, CONCENTRATIONS, BIOLOGICAL EFFECTS, WASTEWATERS

0606 " METABOLISM, EXTRACTION, PRODUCTION, WASTEWATERS, TOXICITY, *ANALS, *RATS

0607 " OIL INDUSTRY, MUTAGENS, CRUDE OIL, CARCINOGENS, PAH

0608 " OIL INDUSTRY, EXTRACTION, CHRONIC EFFECTS, CARCINOGENS, USSR, *CANCER INCIDENCE, *ESTONIA

0610 " EXTRACTION, CHEMICAL EFFECTS, CHEMICAL ANALYSIS, TOXICITY, WASTEWATERS, WATER QUALITY

0613 " HEALTH HAZARDS, CHRONIC EFFECTS, ANIMALS, PETROLEUM PRODUCTS, TOXICITY, USSR, *PHENOLS, *ESTONIA

0632 " EXTRACTION, ENVIRONMENTAL EFFECTS, VEGETATION

0636 " HABITATS, ENVIRONMENTAL EFFECTS, WATER QUALITY, WILDLIFE, SOCIOECONOMIC EFFECTS

0639 OIL SPILL, MONITORING, ENVIRONMENTAL EFFECTS, DEVELOPMENT, BASELINE STUDIES,
PRODUCTION, *PROCEEDINGS

0657 " EPA, ENVIRONMENTAL EFFECTS, DEVELOPMENT, POLLUTION PREVENTION, POLLUTION CONTROL,
REGULATIONS, *ENFORCEMENT

0680 " MORTALITY, LEAKAGE, DISPERSANTS, BIRDS, OIL TRANSFER

0022 OIL SLICKS, EQUIPMENT, DESIGN-ENGINEERING, PATENT

0028 " EQUIPMENT, DETECTION, DESIGN-ENGINEERING, PATENT

0034 " CANADA, ANALYTICAL TECHNIQUES, REMOTE SENSING, SOURCE IDENTIFICATION, *FLUORESCENCE

0035 " REMOTE SENSING, UK, *THERMAL IR MEASUREMENTS

0036 " CONTAMINATION, REMOTE SENSING, SEA SURFACE, *LASER RADAR

0135 " BOOMS, SPILL CONTAINMENT, PHYSICAL ASPECTS

0138 " EQUIPMENT, SPILL CLEANUP, SPILL RESPONSE, *IHC SLICKTRAIL

0160 " EQUIPMENT, SORBENTS, SPILL REMOVAL, *FOAM STRIPS

0161 " SPILL REMOVAL, PERFORMANCE TESTING, PRODUCT INFORMATION

0173 " EQUIPMENT, SPILL REMOVAL, PATENT

0200 " INFORMATION SYSTEMS, EQUIPMENT, BEHAVIOR, SPILL RESPONSE, USCG, STATISTICAL
ANALYSIS, TANKERS

0279 " MORTALITY, HARBORS, COASTAL WATERS, BIRDS, UK

0410 " NORTH SEA, FATE, EKOFISK BLOWOUT, DISTRIBUTION, BEHAVIOR

0489 " NORTH SEA, ENVIRONMENTAL EFFECTS, EKOFISK BLOWOUT

0508 " IXTOC 1 BLOWOUT, ENVIRONMENTAL EFFECTS, COASTAL WATERS, BEHAVIOR, SPILL CLEANUP,
TEXAS

0528 " BIODEGRADATION, PRODUCT INFORMATION

0542 " EVAPORATION, PHYSICAL ASPECTS, *WIND WAVES

0545 " BEHAVIOR, SEA SURFACE, PHYSICAL ASPECTS, *SUNLIGHT GLITTER

0547 " MOVEMENT, DRIFT, BEHAVIOR, PHYSICAL ASPECTS, *WAVE AND WIND ACTION

0548 " DRIFT, BEHAVIOR, PHYSICAL EFFECTS

0549 " DRIFT, BEHAVIOR, SPREADING, SEA SURFACE

0552 " MOVEMENT, BEHAVIOR, PHYSICAL EFFECTS

0553 " MOVEMENT, ICE, CRUDE OIL, BEHAVIOR, *CURRENTS, *OIL-UNDER-ICE

0554 " MOVEMENT, IXTOC 1 BLOWOUT, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, DRIFT, BEHAVIOR

0560 " HARBORS, PREDICTIONS, SPILL TRAJECTORIES, *HAWAII

0575 " NORTH SEA, FATE, EKOFISK BLOWOUT, CRUDE OIL, WEATHERING

0584 " NORTH SEA, MOVEMENT, FATE, EKOFISK BLOWOUT, BEHAVIOR

0661 " CARIBBEAN SEA, TANKERS, POLLUTION CONTROL, SPILL RESPONSE

0010 OIL SPILLS, MARINE ENVIRONMENT, SOURCE IDENTIFICATION

0033 " MONITORING, DETECTION, REMOTE SENSING

0037 " REMOTE SENSING, SOURCE IDENTIFICATION, STATISTICAL ANALYSIS

0043 " MONITORING, EQUIPMENT, DETECTION, REMOTE SENSING, PERFORMANCE TESTING,
*SCATTEROMETER, *RADAR

0104 " DETECTION, CONTAMINATION, CHEMICAL ANALYSIS, SAMPLING, SOURCE IDENTIFICATION

0117 " CHEMICAL ANALYSIS, SOURCE IDENTIFICATION

0118 " ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, WEATHERING, USCG, *COMPUTERIZED
PATTERN RECOGNITION

0119 " OIL DISCHARGES, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, TANKERS,
SAMPLING, TAR

0120 " MODELS, INFORMATION SYSTEMS, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION,
*PATTERN RECOGNITION

0123 " CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, *SULFUR ISOTOPES

0136 " CANADA, SPILL CONTAINMENT, PERFORMANCE TESTING, ONSHORE, *AIR SPARGING SYSTEMS,
*FEASIBILITY STUDY

0151 " SPILL CLEANUP, *GELATION

0192 " CONTINGENCY PLANNING, COASTS, CANADA, BEHAVIOR, PERSONNEL TRAINING, SPILL
RESPONSE, *WORKSHOPS

0194 " NEW YORK, HARBORS, BAYS, SHIPS, SPILL CLEANUP

0223 " INTERNATIONAL CONVENTIONS, INCO, DISPERSANTS, CONTINGENCY PLANNING, *MALTA CENTER

0225 " INFORMATION SYSTEMS, RISK ANALYSIS, STATISTICS, USCG, *PIRS

0226 " LIABILITY, INCO, COMPENSATION

0233 " OIL REMOVAL, GROUNDWATER, DISPOSAL, CONTAMINATION, POLLUTION PREVENTION,
RECOVERY, RESTORATION

0252 " BIRDS, POLLUTION PREVENTION, *DETERRENT DEVICES

0275 " MARINE ORGANISMS, FUEL OIL, COASTS, BIRDS, SCOTLAND

0333 " NORTH SEA, BIOLOGICAL EFFECTS, PLANKTON

0342 " CONTAMINATION, CHEMICAL ANALYSIS, CANADA, BIRDS, ATLANTIC COAST, ARGO MERCHANT
SPILL, COLD CLIMATE, *GRANT ZENITH SPILL

0356 " MARINE ORGANISMS, CONTAMINATION, CHRONIC EFFECTS, ACUTE EFFECTS

0409 " COASTS, ALASKA, SEDIMENTATION, *COASTAL MORPHOLOGY, *POTENTIAL SPILL IMPACTS

0424 " NEW JERSEY, LAND FARMING, RESTORATION, SOIL, ONSHORE, RECLAMATION

0465 " ENVIRONMENTAL EFFECTS, CARIBBEAN SEA, PUERTO RICO

0472 " MARINE ENVIRONMENT, UK, *ANNUAL REPORT - 1976

0473 " MARINE ENVIRONMENT, UK, *ANNUAL REPORT - 1977

0476 " LEAKAGE, GROUNDWATER, WATER QUALITY

0479 " OIL REMOVAL, BURNING, BEAUFORT SEA, ARCTIC, POLLUTION CONTROL

0485 " ENVIRONMENTAL EFFECTS, COASTAL WATERS, BAYS, ALASKA, SHORPLINES, *VULNERABILITY
INDEX

0505 OIL SPILLS, EXPLORATION, ENVIRONMENTAL EFFECTS, BOOK REVIEW, PRODUCTION
 0509 " ENVIRONMENTAL EFFECTS, CHRONIC EFFECTS
 0511 " ENVIRONMENTAL EFFECTS, DELAWARE, ATLANTIC COAST, *SEA GRANT RESEARCH
 0513 " ENVIRONMENTAL EFFECTS, BIODEGRADATION, BEHAVIOR, STATISTICS, SPILL CLEANUP,
 TANKERS, SHIPS, SPILL CONTAINMENT, *GENERAL REVIEW
 0563 " DRIFT, BEHAVIOR, PREDICTIONS
 0566 " OIL-GAS LEASING, OCS, GULF OF ALASKA, RISK ANALYSIS
 0568 " OCS, ATLANTIC COAST, PREDICTIONS, SEDIMENTS, RISK ANALYSIS, SANTA BARBARA CHANNEL
 0574 " OCS, NORWAY, FATE, BEHAVIOR
 0589 " MICROORGANISMS, FATE, DISPERSION, BIODEGRADATION, SEA SURFACE, WEATHERING,
 SEDIMENTATION
 0590 " MARINE ENVIRONMENT, ENVIRONMENTAL EFFECTS
 0592 " ICE, FATE, COLD CLIMATES, BEHAVIOR, BEAUFORT SPA, ARCTIC, PHYSICAL ASPECTS
 0596 " BUZZARDS BAY, ARCTIC, *COMPARISON STUDY
 0597 " COASTS, COASTAL ZONE MANAGEMENT, RIVERS, *VULNERABILITY INDEX
 0634 " ENVIRONMENTAL EFFECTS, DRILLING, COASTS, ONSHORE IMPACTS, SOCIOECONOMIC EFFECTS
 0660 " COASTAL WATERS, BURNING, BEACHES, TEXAS, *BURMAH AGATE SPILL
 0663 " GOVERNMENT AGENCIES, TANKERS, SPILL RESPONSE, UK, *PLENI V SPILL
 0667 " TANKERS, *ACCIDENTS
 0668 " OIL DISCHARGES, INTERNATIONAL AGREEMENTS, INCO, TANKERS, *PROCEEDINGS
 0671 " ARGO MERCHANT SPILL, TANKERS
 0674 " LEAKAGE, PIPELINES, TRANS-ALASKA PIPELINE, RIVERS
 0676 " EUROPE, CONTAMINATION, PIPELINES, RECOVERY
 0677 " OIL INDUSTRY, EUROPE, PIPELINES, STATISTICS, SPILL REMOVAL
 0691 " OFFSHORE, INFORMATION SYSTEMS, FRANCE, DRILLING, TANKERS, SHIPS, SOURCES, *DATA
 BANK, *ACCIDENTS
 0694 " NEW JERSEY, FISHERIES, SHIPS, *TOURISM
 0696 " INFORMATION SYSTEMS, COASTAL WATERS, STATISTICS, USCG, US, *1977-1978 DATA
 0742 " INFORMATION SYSTEMS, COASTAL WATERS, *NEWSPAPER COVERAGE
 0005 OIL TANKS, OIL DISCHARGES, MONITORING, LEAKAGE, EQUIPMENT, PIPELINES, OIL TRANSFER
 0214 " OIL REMOVAL, CONTINGENCY PLANNING, AMOCO CADIZ SPILL, TANKERS, STOPAGE, OIL
 TRANSFER
 0687 " ENVIRONMENTAL EFFECTS, BALLAST, ALASKA, STORAGE, PORTS, OIL-WATER SEPARATION
 0689 " STORAGE, SPILL CONTAINMENT, *MONOGRAPH
 0681 OIL TERMINALS, BALLAST, POLLUTION PREVENTION, REGULATIONS, TANKERS, OIL TRANSFER, UK,
 *SULLON VOE
 0005 OIL TRANSFER, OIL TANKS, OIL DISCHARGES, MONITORING, LEAKAGE, EQUIPMENT, PIPELINES
 0214 " OIL TANKS, OIL REMOVAL, CONTINGENCY PLANNING, AMOCO CADIZ SPILL, TANKERS, STOPAGE
 0680 " OIL SHALE, MORTALITY, LEAKAGE, DISPERSANTS, BIRDS
 0681 " OIL TERMINALS, BALLAST, POLLUTION PREVENTION, REGULATIONS, TANKERS, UK, *SULLON
 VOE
 0682 " HARBORS, ENVIRONMENTAL EFFECTS, OIL TRANSPORT
 0683 " ENVIRONMENTAL EFFECTS, CANADA, PORTS, PACIFIC COAST, OIL TRANSPORT, RISK ANALYSIS
 0684 " ENVIRONMENTAL EFFECTS, CANADA, PORTS, PACIFIC COAST, OIL TRANSPORT, RISK ANALYSIS
 0692 " HYDROCARBONS, HARBORS, CALIFORNIA, OIL TRANSPORT, PORTS
 0697 " ENVIRONMENTAL EFFECTS, ECONOMICS, OIL TRANSPORT, TANKERS, PACIFIC OCEAN, PORTS,
 *MALACCA STRAITS, *PALAU
 0664 OIL TRANSPORT, TANKERS, STATISTICAL ANALYSIS, *COLLISIONS, *GROUNDINGS
 0665 " OIL DISCHARGES, INTERNATIONAL AGREEMENTS, EQUIPMENT, TANKERS, POLLUTION CONTROL,
 PERSONNEL TRAINING, *SUBSTANDARD SHIPS
 0678 " LEAKAGE, PIPELINES, *PIPELINE FAILURE
 0682 " OIL TRANSFER, HARBORS, ENVIRONMENTAL EFFECTS
 0683 " OIL TRANSFER, ENVIRONMENTAL EFFECTS, CANADA, PORTS, PACIFIC COAST, RISK ANALYSIS
 0684 " OIL TRANSFER, ENVIRONMENTAL EFFECTS, CANADA, PORTS, PACIFIC COAST, RISK ANALYSIS
 0690 " GUIDELINES, TANKERS, REGULATIONS, SAFETY, POLLUTION PREVENTION, PERSONNEL
 TRAINING, USCG
 0692 " OIL TRANSFER, HYDROCARBONS, HARBORS, CALIFORNIA, PORTS
 0695 " OCS, DEVELOPMENT, SHIPS, TANKERS, PRODUCTION, PORTS, SANTA BARBARA CHANNEL,
 PACIFIC COAST
 0697 " OIL TRANSFER, ENVIRONMENTAL EFFECTS, ECONOMICS, TANKERS, PACIFIC OCEAN, PORTS,
 *MALACCA STRAITS, *PALAU
 0142 OIL-WATER SEPARATION, OIL REMOVAL, SPILL CLEANUP, PRODUCT INFORMATION
 0144 " EQUIPMENT, SPILL CLEANUP, SKIMMERS, SHIPS
 0166 " EQUIPMENT, SPILL REMOVAL, PRODUCT INFORMATION
 0167 " DESIGN-ENGINEERING, SPILL REMOVAL, PRODUCT INFORMATION
 0170 " ADSORPTION, WASTEWATER TREATMENT, SORBENTS, PATENT, *KAPOK FIBERS
 0177 " EQUIPMENT, SPILL CLEANUP, WASTEWATERS, SKIMMERS, PATENT
 0187 " EQUIPMENT, SKIMMERS, PERFORMANCE TESTING, SPILL RECOVERY, *PUMPS
 0231 " INTERNATIONAL AGREEMENTS, EQUIPMENT, BLOWOUTS, POLLUTION CONTROL, REGULATIONS,
 PRODUCT INFORMATION
 0402 " HYDROCARBONS, CRUDE OIL, *CHARGE-TRANSFER
 0482 " CHEMICAL ANALYSIS, SAMPLING, SOURCE IDENTIFICATION, WASTEWATERS, *PROCEEDINGS
 0544 " OIL REMOVAL, EMULSIFICATION, PHYSICAL ASPECTS
 0687 " OIL TANKS, ENVIRONMENTAL EFFECTS, BALLAST, ALASKA, STORAGE, PORTS
 0700 " OIL REMOVAL, CONTAMINATION, COALESCENCE, WASTEWATER TREATMENT, PATENT

0702 OIL-WATER SEPARATION, FLOCCULATION, CONTAMINATION, BIODEGRADATION, WASTEWATER
 TREATMENT, REFINERIES, SLUDGE
 0704 " OIL REMOVAL, REFINERIES, WASTEWATER TREATMENT
 0727 " OIL REMOVAL, SORBENTS, PATENT
 0728 " OIL REMOVAL, FILTRATION, COALESCENCE, SORBENTS, PRODUCT INFORMATION, *MODIFIED PEAT
 0729 " EQUIPMENT, CONTAMINATION, PATENT
 0730 " INDUSTRIES, FLOTATION, FILTRATION, EQUIPMENT, EMULSIONS, ADSORPTION, WASTEWATERS
 0642 OIL WELLS, ENVIRONMENTAL EFFECTS, DRILLING, SURVEILLANCE, *ENHANCED OIL RECOVERY
 0659 " OIL INDUSTRY, OIL FIELDS, LAKES, GROUNDWATER, ENVIRONMENTAL EFFECTS, DISPOSAL,
 WASTEWATERS, ONSHORE, WILDLIFE, *PLAYAS
 0136 ONSHORE, OIL SPILLS, CANADA, SPILL CONTAINMENT, PERFORMANCE TESTING, *AIR SPARGING
 SYSTEMS, *FEASIBILITY STUDY
 0211 " OIL INDUSTRY, EQUIPMENT, CONTINGENCY PLANNING, CANADA, SPILL RESPONSE, *PRAIRIES
 0424 " OIL SPILLS, NEW JERSEY, LAND FARMING, RESTORATION, SOIL, RECLAMATION
 0457 " OFFSHORE, LIABILITY, DEVELOPMENT, COMPENSATION, SOURCES, RIVERS, POLLUTION
 CONTROL, JW, *UNEP CONVENTION
 0458 " SPILL CLEANUP, SPILL DISPOSAL, PIPELINES, *OSCUR
 0527 " BIODEGRADATION, BACTERIA, SOIL, PETROLEUM PRODUCTS, *ROADSIDE ENVIRONMENTS,
 *HIGHWAY RUNOFF
 0595 " OFFSHORE, NATURAL SETPAGE, CALIFORNIA, TAR, SANTA BARBARA CHANNEL, *ASPHALT
 DEPOSITS
 0611 " FISH, DEVELOPMENT, CANADA, BIOLOGICAL EFFECTS, WILDLIFE, *ALBERTA
 0658 " OIL WELLS, OIL INDUSTRY, OIL FIELDS, LAKES, GROUNDWATER, ENVIRONMENTAL EFFECTS,
 DISPOSAL, WASTEWATERS, WILDLIFE, *PLAYAS
 0634 ONSHORE IMPACTS, OIL SPILLS, ENVIRONMENTAL EFFECTS, DRILLING, COASTS, SOCIOECONOMIC
 EFFECTS
 0652 " ENVIRONMENTAL EFFECTS, DISPOSAL, CANADA, WASTEWATERS, *DRILLING METHODS, *ALBERTA
 0088 OREGON, MOLLUSKS, CONCENTRATIONS, CARCINOGENS, PAH, PETROLEUM PRODUCTS, UPTAKE,
 *MUSSELS
 0643 " OIL DISCHARGES, OFFSHORE, OCS, ESTUARIES, DEVELOPMENT, COASTS, ALASKA,
 WASHINGTON, PACIFIC COAST
 0054 OXIDATION, GROUNDWATER, FRESHWATER, CONCENTRATIONS, CHEMICAL ANALYSIS, CANADA, PAH,
 *ONTARIO
 0278 " MUTAGENS, FUEL OIL, TOXICITY, YEASTS, *PHOTOPRODUCTS
 0496 " MARINE ORGANISMS, CHEMICAL EFFECTS, CHEMICAL ANALYSIS, BIODEGRADATION, AMOCO CADIZ
 SPILL
 0501 " GC/MS, CHEMICAL ANALYSIS, AMOCO CADIZ SPILL
 0515 " MICROORGANISMS, LAND FARMING, CHEMICAL EFFECTS, BIODEGRADATION, PHYSICAL ASPECTS,
 SPILL CLEANUP, *STIMULATION
 0534 " METABOLISM, HYDROCARBONS, BIODEGRADATION, *ALKANES
 0587 " METABOLISM, ESTUARIES, COASTAL WATERS, BIODEGRADATION, PAH, UPTAKE
 0391 PACIFIC COAST, MORTALITY, MOLLUSKS, GULF OF ALASKA, CALIFORNIA, PETROLEUM PRODUCTS,
 TOXICITY
 0439 " ENVIRONMENTAL EFFECTS, ECOSYSTEMS, DEVELOPMENT, BASELINE STUDIES, PREDICTIONS
 0643 " OREGON, OIL DISCHARGES, OFFSHORE, OCS, ESTUARIES, DEVELOPMENT, COASTS, ALASKA,
 WASHINGTON
 0683 " OIL TRANSPORT, OIL TRANSFER, ENVIRONMENTAL EFFECTS, CANADA, PORTS, RISK ANALYSIS
 0684 " OIL TRANSPORT, OIL TRANSFER, ENVIRONMENTAL EFFECTS, CANADA, PORTS, RISK ANALYSIS
 0695 " OIL TRANSPORT, OCS, DEVELOPMENT, SHIPS, TANKERS, PRODUCTION, PORTS, SANTA BARBARA
 CHANNEL
 0745 " OFFSHORE, OCS, DEVELOPMENT, ATLANTIC COAST, ALASKA, SAFETY, RISK ANALYSIS, *S,
 *ENVIRONMENTAL HAZARDS
 0075 PACIFIC OCEAN, HYDROCARBONS, DISTRIBUTION, BIODEGRADATION, BACTERIA, *SOUTH CHINA SEA
 0697 " OIL TRANSPORT, OIL TRANSFER, ENVIRONMENTAL EFFECTS, *ECONOMICS, TANKERS, PORTS,
 *MALACCA STRAITS, *PALAU
 0009 PAH, DETECTION, COASTS, CANADA, SOURCE IDENTIFICATION, SEDIMENTS, *SHELLFISH,
 *CREOSOTE, *WHARF STRUCTURES
 0019 " DETECTION, CHROMATOGRAPHY, CHEMICAL ANALYSIS
 0024 " DETECTION, CHEMICAL ANALYSIS, ANIMALS
 0031 " HYDROCARBONS, GC/MS, ESTUARIES, DISTRIBUTION, SEDIMENTS, *DIATOMS
 0054 " OXIDATION, GROUNDWATER, FRESHWATER, CONCENTRATIONS, CHEMICAL ANALYSIS, CANADA,
 *ONTARIO
 0056 " OCS, HYDROCARBONS, CHEMICAL ANALYSIS, ATLANTIC COAST, SAMPLING, SEDIMENTS
 0067 " MOLLUSKS, DETECTION, CONCENTRATIONS, CHEMICAL ANALYSIS, *MUSSELS
 0070 " CHROMATOGRAPHY, CHEMICAL ANALYSIS, SAMPLING
 0080 " CHEMICAL ANALYSIS, *FLUORESCENCE EXCITATION AND EMISSION
 0084 " DISTRIBUTION, CONCENTRATIONS, SEDIMENTS, SOURCES, *COMBUSTION, *URBAN CENTERS
 0088 " OREGON, MOLLUSKS, CONCENTRATIONS, CARCINOGENS, PETROLEUM PRODUCTS, UPTAKE, *MUSSELS
 0096 " OIL INDUSTRY, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES
 0097 " MOLLUSKS, MARINE ORGANISMS, FISH, CHEMICAL ANALYSIS
 0103 " CRUDE OIL, CHEMICAL ANALYSIS, PETROLEUM PRODUCTS, *BENZO(A)PYRENE
 0107 " LAKES, DISPERSION, AQUATIC ENVIRONMENT, SAMPLING, SOURCES, SEDIMENTS
 0111 " MARINE ORGANISMS, DETECTION, ANALYTICAL TECHNIQUES, SEDIMENTS, SEAWATER
 0112 " ANALYTICAL TECHNIQUES, SAMPLING, SOURCE IDENTIFICATION

0124 PAH, MARINE ENVIRONMENT, GROUNDWATER, GC/MS, FRESHWATER, SOURCE IDENTIFICATION, SEDIMENTS

0127 " NAPRAGANSETT BAY, ESTUARIES, DISTRIBUTION, SOURCE IDENTIFICATION, SEDIMENTS

0266 " MOLLUSKS, MARINE ORGANISMS, *ONCOGENIC PROPERTIES

0269 " METABOLISM, FISH, *ENZYME ACTIVITY

0291 " MOLLUSKS, FISH, CRUSTACEANS, CONTAMINATION, CARCINOGENS, UPTAKE, *COMMERCIAL SEAFOODS, *CREOSOTE

0299 " FISH, *RAINBOW TROUT, *MIXED-FUNCTION OXIDASE ACTIVITY

0316 " MOLLUSKS, MARINE ORGANISMS, DISTRIBUTION, DECONTAMINATION, AQUATIC ENVIRONMENT, UPTAKE

0334 " MORTALITY, DEVELOPMENT, CRUSTACEANS, TOXICITY, *MUD CRABS, *NAPHTHALENE, *PHENANTHRENE, *SALINITY AND TEMPERATURE EFFECTS

0353 " FISH, DECONTAMINATION, CHRONIC EFFECTS, ACUTE EFFECTS, UPTAKE, *ACCUMULATION, *RAINBOW TROUT, *NAPHTHALENE

0384 " FISH, DECONTAMINATION, CRUDE OIL, UPTAKE, *COALFISH, *PHENANTHRENE

0469 " ENVIRONMENTAL EFFECTS, CARCINOGENS, TOXICITY

0525 " MICROORGANISMS, COASTAL WATERS, BIODEGRADATION, BENTHOS, ANNELIDS, SEDIMENTS, *POLYCHAETE WORMS

0537 " MICROORGANISMS, FRESHWATER, BIODEGRADATION, SAMPLING, *PHENANTHRENE

0551 " FATE, CONCENTRATIONS, CHEMICAL EFFECTS, BAYS, SOURCES, SEDIMENTS, WASHINGTON, ZOOPLANKTON, *FECAL PELLITS

0572 " HYDROCARBONS, FATE, CONCENTRATIONS, AQUATIC ENVIRONMENT, ANALYTICAL TECHNIQUES, TOXICITY

0587 " OXIDATION, METABOLISM, ESTUARIES, COASTAL WATERS, BIODEGRADATION, UPTAKE

0603 " OIL SHALE, MUTAGENS, HEALTH HAZARDS, EXTRACTION, CRUDE OIL, WASTEWATERS

0607 " OIL SHALE, OIL INDUSTRY, MUTAGENS, CRUDE OIL, CARCINOGENS

0622 PATENT, OIL SLICKS, EQUIPMENT, DESIGN-ENGINEERING

0628 " OIL SLICKS, EQUIPMENT, DETECTION, DESIGN-ENGINEERING

0131 " EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT

0137 " EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, SPILL REMOVAL

0146 " ADSORPTION, SPILL CLEANUP, SORBENTS, *FIBER MATS

0147 " EQUIPMENT, BEACH CLEANUP, SEDIMENTS, *CRYOGENIC METHOD

0148 " OIL REMOVAL, ADSORPTION, SORBENTS, *COIL DUST

0152 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SKINNERS

0163 " ADSORPTION, SPILL REMOVAL, SORBENTS, *PELITE

0170 " OIL-WATER SEPARATION, ADSORPTION, WASTEWATER TREATMENT, SORBENTS, *KAPOK FIBERS

0172 " MICROORGANISMS, DISPERSANTS, BIODEGRADATION, SPILL REMOVAL

0173 " OIL SLICKS, EQUIPMENT, SPILL REMOVAL

0175 " GRAVITY SEPARATION, EQUIPMENT, SPILL CLEANUP, SKINNERS

0177 " OIL-WATER SEPARATION, EQUIPMENT, SPILL CLEANUP, WASTEWATERS, SKINNERS

0181 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CONTAINMENT, SPILL REMOVAL

0700 " OIL-WATER SEPARATION, OIL REMOVAL, CONTAMINATION, COALESCENCE, WASTEWATER TREATMENT

0727 " OIL-WATER SEPARATION, OIL REMOVAL, SORBENTS

0729 " OIL-WATER SEPARATION, EQUIPMENT, CONTAMINATION

0002 PERFORMANCE TESTING, EQUIPMENT, TRANS-ALASKA PIPELINE, SPILL RESPONSE

0026 " MOVEMENT, MONITORING, ICE, DETECTION, DESIGN-ENGINEERING, REMOTE SENSING

0043 " OIL SPILLS, MONITORING, EQUIPMENT, DETECTION, REMOTE SENSING, *ECHO-SONAR, *RADAR

0132 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CONTAINMENT, RIVERS, *AIR BUBBLE DIVERTER

0133 " DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, *AIR JET BOOM

0134 " DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, UK

0136 " ONSHORE, OIL SPILLS, CANADA, SPILL CONTAINMENT, *AIR SPARGING SYSTEMS, *FEASIBILITY STUDY

0139 " SPILL CLEANUP, SKINNERS, PRODUCT INFORMATION, *BRAVO BLOWOUT

0141 " EQUIPMENT, SPILL CLEANUP, SPILL REMOVAL, UK, SORBENTS, *POLYPROPYLENE HOP

0143 " SPILL CLEANUP, SORBENTS, SWEDEN, *BREGOIL

0146 " EQUIPMENT, COLD CLIMATES, SPILL CLEANUP, SKINNERS

0154 " EQUIPMENT, DESIGN-ENGINEERING, ADSORPTION, SPILL CLEANUP

0156 " DISPERSANTS, SPILL CLEANUP, SPILL REMOVAL, *FEASIBILITY STUDIES, *AERIAL APPLICATION

0157 " INTERTIDAL ZONE, DISPERSANTS, BIOLOGICAL EFFECTS, BIOASSAY, BEACH CLEANUP, TOXICITY

0161 " OIL SLICKS, SPILL REMOVAL, PRODUCT INFORMATION

0164 " INCINERATION, EQUIPMENT, SPILL CLEANUP, *KURDISTAN SPILL

0168 " EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, SPILL CLEANUP, SKINNERS, UK

0178 " EQUIPMENT, SPILL CLEANUP, SKINNERS, PRODUCT INFORMATION

0179 " DESIGN-ENGINEERING, COLD CLIMATES, CANADA, ARCTIC, SPILL CLEANUP, SKINNERS, *AROP

0183 " EQUIPMENT, SPILL CLEANUP, SKINNERS, PRODUCT INFORMATION

0184 " ICE, BURNING, ARCTIC, SPILL REMOVAL, *COMBUSTION PROMOTERS

0185 " EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, SKINNERS, *WINGERS

0187 " OIL-WATER SEPARATION, EQUIPMENT, SKINNERS, SPILL RECOVERY, *PTMS

0190 " OIL INDUSTRY, EQUIPMENT, DISPERSANTS, CALIFORNIA, PERSONNEL TRAINING, SPILL CLEANUP, JSCS

0234 " EQUIPMENT, COLD CLIMATES, CANADA, BURNING, SPILL REMOVAL, *INCENDIARY DEVICES

0242 " EQUIPMENT, EPA, DESIGN-ENGINEERING, SPILL CLEANUP, *CHESSETT TEST FACILITY

0345 " MARINE ORGANISMS, ADSORPTION, SORBENTS, PRODUCT INFORMATION, TOXICITY

0593 PERFORMANCE TESTING, ICE, FATE, EQUIPMENT, BURNING, BEHAVIOR, ARCTIC
0159 PERSONNEL TRAINING, MANUALS, GUIDELINES, CONTINGENCY PLANNING, SPILL CLEANUP, SPILL
RESPONSE
0180 " DISPERSANTS, SPILL CLEANUP, REGULATIONS, SPILL COOPERATIVES
0190 " PERFORMANCE TESTING, OIL INDUSTRY, EQUIPMENT, DISPERSANTS, CALIFORNIA, SPILL
CLEANUP, USCG
0191 " OIL REMOVAL, EQUIPMENT, CONTINGENCY PLANNING, SPILL CLEANUP
0192 " OIL SPILLS, CONTINGENCY PLANNING, COASTS, CANADA, BEHAVIOR, SPILL RESPONSE,
*WORKSHOPS
0212 " GOVERNMENT AGENCIES, CONTINGENCY PLANNING, BIOLOGICAL EFFECTS, SPILL RESPONSE,
WILDLIFE, *USFWS, *WORKSHOP
0221 " GOVERNMENT AGENCIES, CONTINGENCY PLANNING, SPILL RESPONSE, *USFWS
0460 " OFFSHORE, IXTOC 1 BLOWOUT, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, REGULATIONS
0665 " OIL TRANSPORT, OIL DISCHARGES, INTERNATIONAL AGREEMENTS, EQUIPMENT, TANKERS,
POLLUTION CONTROL, *SUBSTANDARD SHIPS
0690 " OIL TRANSPORT, GUIDELINES, TANKERS, REGULATIONS, SAFETY, POLLUTION PREVENTION, USCG
0182 PETROCHEMICALS, INCINERATION, DESIGN-ENGINEERING, SPILL CLEANUP, SLUDGE,
*DETOXIFICATION, *RESIDUAL OILS
0276 " HYDROCARBONS, FISH, ACUTE EFFECTS, TOXICITY, *GOLDFISH
0360 " MEDITERRANEAN SEA, CRUSTACEANS, BIOLOGICAL EFFECTS, PORTS, *BAENACLES
0701 " CONTAMINATION, AROMATIC HYDROCARBONS, WASTEWATER TREATMENT, *STYRENE MONOMER
FACILITY
0715 " BIOLOGICAL TREATMENT, REFINERIES, WASTEWATER TREATMENT
0048 PETROLEUM PRODUCTS, CRUDE OIL, REMOTE SENSING, SOURCE IDENTIFICATION, *LASEP
FLUOROSENSORS
0064 " MANUALS, BIOGENIC HYDROCARBONS, ANALYTICAL TECHNIQUES, *DISCRIMINATION
0089 " PAH, OREGON, MOLLUSKS, CONCENTRATIONS, CARCINOGENS, UPTAKE, *MUSSELS
0095 " EQUIPMENT, DETECTION, CHEMICAL ANALYSIS, *FIELD DEPLOYABLE INSTRUMENT
0103 " PAH, CRUDE OIL, CHEMICAL ANALYSIS, *BENZO(A) PYRENE
0307 " MICROORGANISMS, CRUDE OIL, BACTERIA, UPTAKE, TOXICITY
0323 " METABOLISM, DEVELOPMENT, BIOLOGICAL EFFECTS, *PORPHYRA
0327 " METABOLISM, MARINE ORGANISMS, HYDROCARBONS, BOOK REVIEW, TOXICITY, SUBLETHAL
EFFECTS
0329 " MICROORGANISMS, MARINE ORGANISMS, MARINE ENVIRONMENT, BIOLOGICAL EFFECTS
0330 " MARINE ORGANISMS, ECOSYSTEMS, BIOLOGICAL EFFECTS
0377 " FISH, METABOLISM, WSP, *CARP, *LIPIDS
0391 " PACIFIC COAST, MORTALITY, MOLLUSKS, GULF OF ALASKA, CALIFORNIA, TOXICITY
0394 " GROWTH, DISPERSANTS, TOXICITY, PHYTOPLANKTON, *DIATOMS, *EMULSIFIERS
0396 " MUTAGENS, CRUDE OIL, ALGAE, TOXICITY, *CHLAMYDOMONAS REINHARDTII
0510 " BURNING, ARCTIC, WEATHERING, *CHEMICAL-PHYSICAL ASPECTS, *COMBUSTIBILITY,
*RESIDUAL OILS
0527 " ONSHORE, BIODEGRADATION, BACTERIA, SOIL, *ROADSIDE ENVIRONMENTS, *HIGHWAY RUNOFF
0543 " MOVEMENT, HYDROCARBONS, FATE, ATLANTIC OCEAN, SEDIMENTS, *NEW YORK BIGHT
0570 " GROUNDWATER, CONTAMINATION
0588 " MARINE ENVIRONMENT, FATE, CHEMICAL EFFECTS, BIODEGRADATION, BEHAVIOR, PHYSICAL
ASPECTS, WEATHERING
0600 " OIL SHALE, HEALTH HAZARDS, CRUDE OIL, CARCINOGENS, TAR, USSR, *BENZO(A) PYRENE,
*ESTONIA
0613 " OIL SHALE, HEALTH HAZARDS, CHRONIC EFFECTS, ANIMALS, TOXICITY, USSR, *PHENOLS,
*ESTONIA
0135 PHYSICAL ASPECTS, OIL SLICKS, BOOMS, SPILL CONTAINMENT
0403 " HYDROCARBONS, DISTRIBUTION, DISPERSION, TOXICITY
0416 " EMULSIONS, DISPERSION, CHEMICAL EFFECTS
0417 " MOVEMENT, FATE, BLOWOUTS, BEHAVIOR, SEAWATER, SEA SURFACE
0515 " OXIDATION, MICROORGANISMS, LAND FARMING, CHEMICAL EFFECTS, BIODEGRADATION, SPILL
CLEANUP, *STIMULATION
0542 " OIL SLICKS, EVAPORATION, *WIND WAVES
0544 " OIL-WATER SEPARATION, OIL REMOVAL, EMULSIFICATION
0545 " OIL SLICKS, BEHAVIOR, SEA SURFACE, *SUNLIGHT GLITTER
0547 " OIL SLICKS, MOVEMENT, DRIFT, BEHAVIOR, *WAVE AND WIND ACTION
0550 " NORTH SEA, EKOFISK BLOWOUT, DRIFT, BEHAVIOR
0561 " DISPERSION, DISPERSANTS, BEHAVIOR
0565 " LABRADOR SEA, ICE, CANADA, BLOWOUTS, PREDICTIONS
0582 " FATE, BEHAVIOR, REMOTE SENSING
0588 " PETROLEUM PRODUCTS, MARINE ENVIRONMENT, FATE, CHEMICAL EFFECTS, BIODEGRADATION,
BEHAVIOR, WEATHERING
0592 " OIL SPILLS, ICE, FATE, COLD CLIMATES, BEHAVIOR, BEAUFORT SEA, ARCTIC
0740 " HYDROCARBONS, DETECTION, CHEMICAL ANALYSIS, *INTERCALIBRATION WORKSHOP
0274 PHYSICAL EFFECTS, BOOK REVIEW, BIRDS, BIBLIOGRAPHIES, *USFWS
0406 " INTERTIDAL ZONE, FRANCE, DISTRIBUTION, COASTS, AMOCO CADIZ SPILL, SHORELINES,
SEDIMENTATION
0404 " INTERTIDAL ZONE, DISPERSION, BEACHES, WEATHERING, *MECHANICAL DISPERSAL
0434 " MOVEMENT, ICE, FATE, COLD CLIMATES, BEHAVIOR, BASELINE STUDIES, ALASKA, SPREADING
0435 " CCS, HYDROCARBONS, FATE, ALASKA, ADSORPTION, *SUSPENDED MATTER

0526 PHYSICAL EFFECTS, HYDROCARBONS, EQUIPMENT, CRUDE OIL, BIODEGRADATION, BACTERIA, TAP
SANDS, SEAWATER, *TEMPERATURE
0546 " FATE, EMULSIONS, CRUDE OIL, *EMULSION-SOLID INTERACTION
0548 " OIL SLICKS, DRIFT, BEHAVIOR
0552 " OIL SLICKS, MOVEMENT, BEHAVIOR
0573 " MARINE ENVIRONMENT, FATE, ENVIRONMENTAL EFFECTS, COLD CLIMATES, SUBARCTIC REGIONS
0261 PHYTOPLANKTON, CRUDE OIL, BERING SEA, TOXICITY
0295 " CRUDE OIL, BIOLOGICAL EFFECTS, ARCTIC, ZOOPLANKTON, *TUNDRA PONDS
0314 " HYDROCARBONS, GROWTH, DISTRIBUTION, BIOLOGICAL EFFECTS, SAMPLING
0317 " METABOLISM, CRUDE OIL, AROMATIC HYDROCARBONS, TOXICITY
0319 " HYDROCARBONS, CRUDE OIL, ACUTE EFFECTS, *PHOTOSYNTHESIS, *RESPIRATION
0370 " NORTH SEA, EKOFISK BLOWOUT, PRODUCTION, *RESEARCH REVIEW
0374 " HYDROCARBONS, CONCENTRATIONS, BIOASSAY, ALGAE, WSP
0394 " PETROLEUM PRODUCTS, GROWTH, DISPERSANTS, TOXICITY, *DIATOMS, *EMULSIFIERS
0738 " MARINE ENVIRONMENT, HYDROCARBONS, BIOMASS, BIOLOGICAL EFFECTS, *GULF EXPERIMENT
0005 PIPELINES, OIL TRANSFER, OIL TANKS, OIL DISCHARGES, MONITORING, LEAKAGE, EQUIPMENT
0454 " ONSHORE, SPILL CLEANUP, SPILL DISPOSAL, *OSCUT
0646 " FOSSIL FUELS, ENVIRONMENTAL EFFECTS, DRILLING, STORAGE
0674 " OIL SPILLS, LEAKAGE, TRANS-ALASKA PIPELINE, RIVERS
0675 " FISHERIES, FISH, PUGET SOUND, ENVIRONMENTAL EFFECTS, *SALMON
0676 " OIL SPILLS, EUROPE, CONTAMINATION, RECOVERY
0677 " OIL SPILLS, OIL INDUSTRY, EUROPE, STATISTICS, SPILL REMOVAL
0678 " OIL TRANSPORT, LEAKAGE, *PIPELINE FAILURE
0679 " GOVERNMENT AGENCIES, FISH, TRANS-ALASKA PIPELINE, WILDLIFE, REGULATIONS
0332 PLANKTON, NORTH SEA, EKOFISK BLOWOUT, BIOLOGICAL EFFECTS
0333 " OIL SPILLS, NORTH SEA, BIOLOGICAL EFFECTS
0355 " METABOLISM, LAKES, CRUDE OIL, BIOMASS, ARCTIC, ALGAE
0459 " NORTH SEA, FISH, ENVIRONMENTAL EFFECTS, EKOFISK BLOWOUT
0287 PLANTS, MARSHES, GROWTH, CRUDE OIL, SEDIMENTS, *SPARTINA ALTERNIFLOPA
0349 " ALASKA, SUBLETHAL EFFECTS, *SEAGRASS PHOTOSYNTHESIS
0425 " MASSACHUSETTS, MARSHES, FUEL OIL, FATE, ESTUARIES, RECOVERY
0474 " MARINE ORGANISMS, COASTAL WATERS, AMOCO CADIZ SPILL, SEDIMENTS, SHORELINES
0517 " MARINE ORGANISMS, CRUDE OIL, CANADA, BIODEGRADATION, ARCTIC
0529 " LAND FARMING, FATE, CRUDE OIL, CONTAMINATION, BIODEGRADATION, ALASKA, SOIL
0699 " LAND FARMING, EMULSIONS, DISPOSAL, WASTE OIL, SOIL, TOXICITY
0718 " LAND FARMING, DISPOSAL, SOIL, WASTE OIL
0720 " MONITORING, LAND FARMING, FUEL OIL, DISPOSAL, CRUDE OIL, CRANKCASE OIL,
BIOLOGICAL EFFECTS, WASTE OIL, SOIL
0013 PLATFORMS, OIL FIELDS, OFFSHORE, MONITORING, SANTA BARBARA CHANNEL, RISK ANALYSIS,
*SEISMICITY
0220 " IXTOC 1 BLOWOUT, BLOWOUTS, SPILL RESPONSE
0241 " OFFSHORE, LOUISIANA, BLOWOUTS, POLLUTION CONTROL, PRODUCTION
0468 " OFFSHORE, OCS, HABITATS, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, PRODUCTION, TEXAS,
*BUCCANEER OIL FIELD
0604 " HYDROCARBONS, GULF OF MEXICO, DEPURATION, CRUSTACEANS, CONCENTRATIONS, UPTAKE,
*BARNACLES, *ALKANES
0609 " OFFSHORE, MARINE ORGANISMS, FISHERIES, ENVIRONMENTAL EFFECTS, DRILLING, CORAL
REEFS, *DRILLING MUDS
0631 " OFFSHORE, OCS, BLOWOUTS, PRODUCTION, STATISTICS
0638 " OIL INDUSTRY, OFFSHORE, DEVELOPMENT, BLOWOUTS, PRODUCTION, SPILL RESPONSE, SPILL
CLEANUP, SAFETY
0641 " OIL INDUSTRY, OFFSHORE, NORWAY, NORTH SEA, FISHERIES, EXPLORATION, DRILLING
0749 " OFFSHORE, MARINE ORGANISMS, HABITATS, DISTRIBUTION, COASTAL WATERS, CALIFORNIA
0044 POLLUTION CONTROL, MONITORING, ESTUARIES, DETECTION, BIBLIOGRAPHIES, REMOTE SENSING
0176 " DISPERSANTS, TOXICITY, SURFACTANTS, SPILL REMOVAL, TANKERS
0198 " DISPERSION, SPILL CLEANUP, SKIMMERS, TANKERS, *OIL STRANDING
0204 " DISPERSANTS, SPILL RESPONSE
0207 " HYDROCARBONS, FRANCE, CRUDE OIL, AMOCO CADIZ SPILL, SPILL RESPONSE
0222 " GOVERNMENT AGENCIES, CONTINGENCY PLANNING, CALIFORNIA, BIRDS, SPILL RESPONSE
0231 " OIL-WATER SEPARATION, INTERNATIONAL AGREEMENTS, EQUIPMENT, BLOWOUTS, REGULATIONS,
PRODUCT INFORMATION
0232 " EQUIPMENT, BLOWOUT PREVENTION, BIBLIOGRAPHIES, SPILL CLEANUP, POLLUTION PREVENTION
0236 " MARINE ENVIRONMENT, POLLUTION PREVENTION, UN
0237 " INTERNATIONAL CONVENTIONS, BALTIC SEA, *ENVIRONMENTAL PROTECTION
0239 " OIL INDUSTRY, OIL DISCHARGES, BIRDS, BALLAST, SPILL RESPONSE, TANKERS, SPILL
COOPERATIVES
0240 " MEDITERRANEAN SEA, UN, SPILL RESPONSE
0241 " PLATFORMS, OFFSHORE, LOUISIANA, BLOWOUTS, PRODUCTION
0243 " OIL DISCHARGES, INDUSTRIES, CALIFORNIA, REGULATIONS, WASTEWATERS
0244 " OIL INDUSTRY, LEGISLATION, INTERNATIONAL CONVENTIONS, REGULATIONS, US, *NAVIGATION
AIDS
0245 " OIL INDUSTRY, MONITORING, MARINE ORGANISMS, INTERNATIONAL AGREEMENTS, ECOSYSTEMS,
RED SEA, WASTEWATERS, *ALESCO
0249 " LEGISLATION, INTERNATIONAL AGREEMENTS, ECONOMICS, MARINE ENVIRONMENTS, *BETWEEN
0250 " MARINE ENVIRONMENT, INTERNATIONAL AGREEMENTS, *LAW OF THE SEA

0454 POLLUTION CONTROL, MARINE ENVIRONMENT, LEGISLATION, INTERNATIONAL AGREEMENTS, COASTAL
WATERS, CANADA

0457 " ONSHORE, OFFSHORE, LIABILITY, DEVELOPMENT, COMPENSATION, SOURCES, RIVERS, UN,
*UNITED CONVENTION

0479 " OIL SPILLS, OIL REMOVAL, BURNING, BEAUFORT SEA, ARCTIC

0486 " HYDROCARBONS, FATE, ENVIRONMENTAL EFFECTS, COST ANALYSIS, BEHAVIOR

0498 " HYDROCARBONS, FATE, ENVIRONMENTAL EFFECTS, COST ANALYSIS, BOOK REVIEW, BEHAVIOR

0519 " MICROORGANISMS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, SPILL RESPONSE, *CONTAINED
SPILLS

0625 " OIL INDUSTRY, OFFSHORE, OCS, LEGISLATION, RIS, US

0626 " OFFSHORE, OCS, LEGISLATION, GUIDELINES, ENVIRONMENTAL EFFECTS, DEVELOPMENT

0657 " OIL SHALE, EPA, ENVIRONMENTAL EFFECTS, DEVELOPMENT, POLLUTION PREVENTION,
REGULATIONS, *ENFORCEMENT

0661 " OIL SLICKS, CARIBBEAN SEA, TANKERS, SPILL RESPONSE

0665 " PERSONNEL TRAINING, OIL TRANSPORT, OIL DISCHARGES, INTERNATIONAL AGREEMENTS,
EQUIPMENT, TANKERS, *SUBSTANDARD SHIPS

0685 " OIL DISCHARGES, BALLAST, TANKERS, SEGREGATED BALLAST, PORTS, *LOAD ON TOP METHOD

0703 " REFINERIES, WASTEWATERS, *EFFLUENT COMPARISONS

0711 " LAND FARMING, BURNING, SPILL CLEANUP, RECLAMATION, WASTE OIL TREATMENT

0229 POLLUTION PREVENTION, GOVERNMENT AGENCIES, DISPERSANTS, SPILL CONTAINMENT, SPILL
CLEANUP, UK

0232 " POLLUTION CONTROL, EQUIPMENT, BLOWOUT PREVENTION, BIBLIOGRAPHIES, SPILL CLEANUP

0233 " OIL SPILLS, OIL REMOVAL, GROUNDWATER, DISPOSAL, CONTAMINATION, RECOVERY,
RESTORATION

0236 " POLLUTION CONTROL, MARINE ENVIRONMENT, UN

0246 " INTERNATIONAL CONVENTIONS, IMCO

0247 " HABITATS, BIRDS, WILDLIFE, RESTORATION

0252 " OIL SPILLS, BIRDS, *DETERRENT DEVICES

0253 " NORWAY, NORTH SEA, CONTINGENCY PLANNING, RISK ANALYSIS, SAFETY

0451 " KUWAIT, INTERNATIONAL CONVENTIONS, UN, *MIDDLE EAST

0657 " POLLUTION CONTROL, OIL SHALE, EPA, ENVIRONMENTAL EFFECTS, DEVELOPMENT,
REGULATIONS, *ENFORCEMENT

0670 " OIL DISCHARGES, DESIGN-ENGINEERING, TANKERS, SEGREGATED BALLAST, SAFETY

0681 " OIL TRANSFER, OIL TERMINALS, BALLAST, REGULATIONS, TANKERS, UK, *SULLOW FOR

0688 " CRUDE OIL, STORAGE, SWEDEN, *UNDERGROUND CAVERNS

0690 " PERSONNEL TRAINING, OIL TRANSPORT, GUIDELINES, TANKERS, REGULATIONS, SAFETY, USCG

0090 PORTS, JAPAN, CONTAMINATION, CHEMICAL ANALYSIS, SEDIMENTS, *OSAKA PORT

0360 " PETROCHEMICALS, MEDITERRANEAN SEA, CRUSTACEANS, BIOLOGICAL EFFECTS, *BARNACLES

0585 " MAINE, HYDROCARBONS, ENVIRONMENTAL EFFECTS, COASTAL WATERS, CHRONIC EFFECTS

0683 " PACIFIC COAST, OIL TRANSPORT, OIL TRANSFER, ENVIRONMENTAL EFFECTS, CANADA, RISK
ANALYSIS

0684 " PACIFIC COAST, OIL TRANSPORT, OIL TRANSFER, ENVIRONMENTAL EFFECTS, CANADA, RISK
ANALYSIS

0685 " POLLUTION CONTROL, OIL DISCHARGES, BALLAST, TANKERS, SEGREGATED BALLAST, *LOAD ON
TOP METHOD

0686 " HARBORS, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, SHIPS, TEXAS, *ENVIRONMENTAL
MANAGEMENT

0687 " OIL-WATER SEPARATION, OIL TANKS, ENVIRONMENTAL EFFECTS, BALLAST, ALASKA, STORAGE

0692 " OIL TRANSPORT, OIL TRANSFER, HYDROCARBONS, HARBORS, CALIFORNIA

0695 " PACIFIC COAST, OIL TRANSPORT, OCS, DEVELOPMENT, SHIPS, TANKERS, PRODUCTION, SANTA
BARBARA CHANNEL

0697 " PACIFIC OCEAN, OIL TRANSPORT, OIL TRANSFER, ENVIRONMENTAL EFFECTS, *ECONOMICS,
TANKERS, *MALACCA STRAITS, *PALAU

0017 PREDICTIONS, MONITORING, MARINE ORGANISMS, MARINE ENVIRONMENT, CONTAMINATION,
BIOINDICATORS

0201 " OFFSHORE, CONTINGENCY PLANNING, CANADA, BLOWOUTS, ARCTIC

0205 " OIL INDUSTRY, OFFSHORE, LABRADOR SEA, GOVERNMENT AGENCIES, EXPLORATION, *EQUIPMENT,
CONTINGENCY PLANNING, CANADA, SPILL RESPONSE

0439 " PACIFIC COAST, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, DEVELOPMENT, BASELINE STUDIES

0443 " OCS, MOVEMENT, LABRADOR SEA, ENVIRONMENTAL EFFECTS, DRILLING, CANADA, BASELINE
STUDIES, SPILL RESPONSE, *TRAJECTORIES, *NEWFOUNDLAND

0555 " MOVEMENT, MODELS, CONCENTRATIONS, SPILL TRAJECTORIES, WEATHERING, SPREADING

0560 " OIL SLICKS, HARBORS, SPILL TRAJECTORIES, *HAWAII

0563 " OIL SPILLS, DRIFT, BEHAVIOR

0564 " MOVEMENT, SPILL TRAJECTORIES

0565 " PHYSICAL ASPECTS, LABRADOR SEA, ICE, CANADA, BLOWOUTS

0563 " OIL SPILLS, OCS, ATLANTIC COAST, SEDIMENTS, RISK ANALYSIS, SANTA BARBARA CHANNEL

0644 " ENVIRONMENTAL EFFECTS, DRILLING, CANADA, OFFSHORE, SAFETY, *LANCASTER SOUND

0139 PRODUCT INFORMATION, PERFORMANCE TESTING, SPILL CLEANUP, SKIMMERS, *BRAVO BLOWOUT

0142 " OIL-WATER SEPARATION, OIL REMOVAL, SPILL CLEANUP

0161 " PERFORMANCE TESTING, OIL SLICKS, SPILL REMOVAL

0166 " OIL-WATER SEPARATION, EQUIPMENT, SPILL REMOVAL

0167 " OIL-WATER SEPARATION, DESIGN-ENGINEERING, SPILL REMOVAL

0178 " PERFORMANCE TESTING, EQUIPMENT, SPILL CLEANUP, SKIMMERS

0183 " PERFORMANCE TESTING, EQUIPMENT, SPILL CLEANUP, SKIMMERS

0231 PRODUCT INFORMATION, POLLUTION CONTROL, OIL-WATER SEPARATION, INTERNATIONAL AGREEMENTS, EQUIPMENT, BLOWOUTS, REGULATIONS

0345 " PERFORMANCE TESTING, MARINE ORGANISMS, ABSORPTION, SORBENTS, TOXICITY

0351 " MICROORGANISMS, DISPERSANTS, BIOLOGICAL EFFECTS, BACTERIA, STATISTICAL ANALYSIS

0528 " OIL SLICKS, BIODEGRADATION

0728 " OIL-WATER SEPARATION, OIL REMOVAL, FILTRATION, COALESCENCE, SORBENTS, *MODIFIED PEAT

0241 PRODUCTION, POLLUTION CONTROL, PLATFORMS, OFFSHORE, LOUISIANA, BLOWOUTS

0305 " BIOLOGICAL EFFECTS, AMOCO CADIZ SPILL, SUBLETHAL EFFECTS, ZOOPLANKTON, *NESTON, *RESPIRATION

0370 " PHYTOPLANKTON, NORTH SEA, EKOFISK BLOWOUT, *RESEARCH REVIEW

0468 " PLATFORMS, OFFSHORE, OCS, HABITATS, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, TEXAS, *BUCCANEER OIL FIELD

0505 " OIL SPILLS, EXPLORATION, ENVIRONMENTAL EFFECTS, BOOK REVIEW

0580 " OIL FIELDS, OIL DISCHARGES, OFFSHORE, NORTH SEA, FATE, CRUDE OIL, BEHAVIOR

0606 " OIL SHALE, METABOLISM, EXTRACTION, WASTEWATERS, TOXICITY, MAMMALS, *RATS

0616 " OFFSHORE, METABOLISM, MARINE ORGANISMS, FOOD WEB, SEDIMENTS, SEDIMENTATION, UPTAKE, *HEAVY METALS

0619 " OFFSHORE, GULF OF MEXICO, EXPLORATION, ECONOMIC EFFECTS, ATLANTIC COAST, WATER QUALITY

0623 " OFFSHORE, NORTH SEA, INTERNATIONAL AGREEMENTS, EKOFISK BLOWOUT, AMOCO CADIZ SPILL, REGULATIONS

0631 " PLATFORMS, OFFSHORE, OCS, BLOWOUTS, STATISTICS

0638 " PLATFORMS, OIL INDUSTRY, OFFSHORE, DEVELOPMENT, BLOWOUTS, SPILL RESPONSE, SPILL CLEANUP, SAFETY

0639 " OIL SHALE, MONITORING, ENVIRONMENTAL EFFECTS, DEVELOPMENT, BASELINE STUDIES, *PROCEEDINGS

0645 " OFFSHORE, FISHERIES, ENVIRONMENTAL EFFECTS, ECONOMICS, US

0647 " OFFSHORE, LOUISIANA, ESTUARIES, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, DRILLING

0648 " OIL-GAS LEASING, OFFSHORE, OCS, FISHERIES, ENVIRONMENTAL EFFECTS, DEVELOPMENT, RESOURCE MANAGEMENT, SANTA BARBARA CHANNEL

0695 " PORTS, PACIFIC COAST, OIL TRANSPORT, OCS, DEVELOPMENT, SHIPS, TANKERS, SANTA BARBARA CHANNEL

0465 PUERTO RICO, OIL SPILLS, ENVIRONMENTAL EFFECTS, CARIBBEAN SEA

0675 PUGET SOUND, PIPELINES, FISHERIES, FISH, ENVIRONMENTAL EFFECTS, *SALMON

0424 RECLAMATION, ONSHORE, OIL SPILLS, NEW JERSEY, LAND FARMING, RESTORATION, SOIL

0711 " POLLUTION CONTROL, LAND FARMING, BURNING, SPILL CLEANUP, WASTE OIL TREATMENT

0717 " LAND FARMING, FUEL OIL, DISPOSAL, BIODEGRADATION, WASTEWATERS, WASTE OIL

0733 " DISPOSAL, CRANKCASE OIL, REFINING, WASTE OIL, RECYCLING

0734 " LEGISLATION, GOVERNMENT AGENCIES, DISPOSAL, WASTE OIL, REFINING, REUSE, *BUREAU OF MINES

0187 RECOVERY, PERFORMANCE TESTING, OIL-WATER SEPARATION, EQUIPMENT, SKIMMERS, SPILL *PUMPS

0233 " POLLUTION PREVENTION, OIL SPILLS, OIL REMOVAL, GROUNDWATER, DISPOSAL, CONTAMINATION, RESTORATION

0425 " PLANTS, MASSACHUSETTS, MARSHES, FUEL OIL, FATE, ESTUARIES

0540 " OIL REMOVAL, MICROORGANISMS, HYDROCARBONS, BIODEGRADATION, BACTERIA

0637 " ENVIRONMENTAL EFFECTS, CONTAMINATION

0642 " OIL WELLS, ENVIRONMENTAL EFFECTS, DRILLING, SURVEILLANCE

0676 " PIPELINES, OIL SPILLS, ENSOPE, CONTAMINATION

0731 RECYCLING, LAND FARMING, FUEL OIL, DISPOSAL, WASTE OIL, REFINING, FUEL, *COMBUSTION

0732 " INDUSTRIES, CONSERVATION, WASTE OIL, REFINING, RESOURCE MANAGEMENT, REGULATIONS

0733 " RECLAMATION, DISPOSAL, CRANKCASE OIL, REFINING, WASTE OIL

0735 " LEGISLATION, DISPOSAL, CALIFORNIA, WASTE OIL, REGULATIONS, US, *MINNESOTA, *UTAH

0736 " LEGISLATION, ITALY, GERMANY, FRANCE, DENMARK, WASTE OIL, REGULATIONS, REUSE, UK, US

0245 RED SEA, POLLUTION CONTROL, OIL INDUSTRY, MONITORING, MARINE ORGANISMS, INTERNATIONAL AGREEMENTS, ECOSYSTEMS, WASTEWATERS, *ALESCO

0007 REFINERIES, MONITORING, BIOINDICATORS, WASTE OIL, WASTEWATERS

0110 " HYDROCARBONS, ESTUARIES, CRANKCASE OIL, CONTAMINATION, CONCENTRATIONS, SOURCES, WASTEWATERS, *URBAN RUNOFF

0304 " FUEL OIL, CRUSTACEANS, WASTEWATERS, TOXICITY, *GRASS SHRIMP

0306 " JAPAN, FISHERIES, BIOLOGICAL EFFECTS, *SETO INLAND SEA, *MARICULTURE, *SEAWEEDS

0363 " MARINE MAMMALS, MAINE, FISHERIES, BIRDS

0398 " MARINE ORGANISMS, HYDROCARBONS, FATE, ACUTE EFFECTS, SUBLETHAL EFFECTS, ESTUARIES, WASTEWATERS

0520 " LAND FARMING, DISPOSAL, BIODEGRADATION, SLUDGE, SOIL, STORAGE

0619 " OIL FIELDS, WASTE OIL, WASTEWATERS, REUSE, WATER QUALITY, SOCIOECONOMIC EFFECTS, *BAVARIA, *BEER, *TOURISM

0633 " MOLLUSKS, FISHERIES, ESTUARIES, ENVIRONMENTAL EFFECTS, CHESAPEAKE BAY, BIOLOGICAL EFFECTS, *OYSTERS

0656 " DOY, BAYS, USCG, SPILL RESPONSE, VIRGINIA

0698 " MARINE ENVIRONMENT, EUROPE, DISPOSAL, TOXICITY, WASTEWATER TREATMENT

0702 " OIL-WATER SEPARATION, FLOCCULATION, CONTAMINATION, BIODEGRADATION, WASTEWATER TREATMENT, SLUDGE

0703 " POLLUTION CONTROL, WASTEWATERS, *EFFLUENT COMPARISONS

0704 " OIL-WATER SEPARATION, OIL REMOVAL, WASTEWATER TREATMENT

0705 REFINERIES, ACTIVATED SLUDGE, WASTEWATER TREATMENT, SOLID WASTES, *ACTIVATED CARBON
 0706 " ACTIVATED SLUDGE, WASTEWATER TREATMENT, SOLID WASTES, *ACTIVATED CARBON
 0707 " ACTIVATED SLUDGE, WASTEWATER TREATMENT, SOLID WASTES, *ACTIVATED CARBON
 0710 " ECONOMICS, COST ANALYSIS, WASTEWATER TREATMENT, *ACTIVATED CARBON
 0714 " FILTRATION, ABSORPTION, WASTEWATER TREATMENT, *ACTIVATED CARBON
 0715 " PETROCHEMICALS, BIOLOGICAL TREATMENT, WASTEWATER TREATMENT
 0737 " BIOLOGICAL EFFECTS, TOXICITY, WASTEWATERS, *TOXICITY TESTING
 0708 REFINING, CONTAMINATION, CHEMICAL ANALYSIS, WASTEWATERS, SAMPLING
 0709 " EPA, WASTEWATERS, SAMPLING, *PRIORITY POLLUTANTS
 0723 " EXTRACTION, WASTEWATER TREATMENT, SOLID WASTES, ENVIRONMENTAL EFFECTS
 0731 " RECYCLING, LAND FARMING, FUEL OIL, DISPOSAL, WASTE OIL, REUSE, *COMBUSTION
 0732 " RECYCLING, INDUSTRIES, CONSERVATION, WASTE OIL, RESOURCE MANAGEMENT, REGULATIONS
 0733 " RECYCLING, RECLAMATION, DISPOSAL, CRANKCASE OIL, WASTE OIL
 0734 " RECLAMATION, LEGISLATION, GOVERNMENT AGENCIES, DISPOSAL, WASTE OIL, REUSE,
 *BUREAU OF MINES
 0180 REGULATIONS, PERSONNEL TRAINING, DISPERSANTS, SPILL CLEANUP, SPILL COOPERATIVES
 0209 " GOVERNMENT AGENCIES, DISPERSANTS, SPILL RESPONSE, *APPLICATION PROCEDURES
 0227 " LIABILITY, SPILL CLEANUP
 0228 " INTERNATIONAL AGREEMENTS, EUROPE, CONTINGENCY PLANNING, AMOCO CADIZ SPILL
 0231 " PRODUCT INFORMATION, POLLUTION CONTROL, OIL-WATER SEPARATION, INTERNATIONAL
 AGREEMENTS, EQUIPMENT, BLOWOUTS
 0243 " POLLUTION CONTROL, OIL DISCHARGES, INDUSTRIES, CALIFORNIA, WASTEWATERS
 0244 " POLLUTION CONTROL, OIL INDUSTRY, LEGISLATION, INTERNATIONAL CONVENTIONS, US,
 *NAVIGATION AIDS
 0452 " INTERNATIONAL CONVENTIONS, EUROPE, AMOCO CADIZ SPILL, *EEC
 0455 " OIL DISCHARGES, LIABILITY, LEGISLATION, US
 0460 " PERSONNEL TRAINING, OFFSHORE, IXTOC 1 BLOWOUT, GULF OF MEXICO, *ENVIRONMENTAL
 EFFECTS
 0622 " OIL INDUSTRY, OFFSHORE, LIABILITY, INTERNATIONAL CONVENTIONS, EXPLOATION
 0623 " PRODUCTION, OFFSHORE, NORTH SEA, INTERNATIONAL AGREEMENTS, EKOFISK BLOWOUT, AMOCO
 CADIZ SPILL
 0657 " POLLUTION PREVENTION, POLLUTION CONTROL, OIL SHALE, EPA, ENVIRONMENTAL EFFECTS,
 DEVELOPMENT, *ENFORCEMENT
 0679 " PIPELINES, GOVERNMENT AGENCIES, FISH, TRANS-ALASKA PIPELINE, WILDLIFE
 0681 " POLLUTION PREVENTION, OIL TRANSFER, OIL TERMINALS, BALLAST, TANKERS, UK, *SULLOW
 VOR
 0690 " POLLUTION PREVENTION, PERSONNEL TRAINING, OIL TRANSPORT, GUIDELINES, TANKERS,
 SAFETY, USCG
 0732 " REFINING, RECYCLING, INDUSTRIES, CONSERVATION, WASTE OIL, RESOURCE MANAGEMENT
 0735 " RECYCLING, LEGISLATION, DISPOSAL, CALIFORNIA, WASTE OIL, US, *MINNESOTA, *UTAH
 0736 " RECYCLING, LEGISLATION, ITALY, GERMANY, FRANCE, DENMARK, WASTE OIL, REUSE, UK, TS
 0026 REMOTE SENSING, PERFORMANCE TESTING, MOVEMENT, MONITORING, ICE, DETECTION,
 DESIGN-ENGINEERING
 0033 " OIL SPILLS, MONITORING, DETECTION
 0034 " OIL SLICKS, CANADA, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION, *FLUORESCENCE
 0035 " OIL SLICKS, UK, *THERMAL IR MEASUREMENTS
 0036 " OIL SLICKS, CONTAMINATION, SEA SURFACE, *LASER RADAR
 0037 " OIL SPILLS, SOURCE IDENTIFICATION, STATISTICAL ANALYSIS
 0038 " FRANCE, CONTAMINATION, COASTAL WATERS, AMOCO CADIZ SPILL
 0039 " FRANCE, DETECTION, SHORELINES
 0040 " MONITORING, SURVEILLANCE, *KURDISTAN SPILL
 0041 " MONITORING, EQUIPMENT, *SPACE TECHNOLOGY
 0042 " MOVEMENT, MONITORING, DRIFT, DETECTION
 0043 " PERFORMANCE TESTING, OIL SPILLS, MONITORING, EQUIPMENT, DETECTION, *SCATTEROMETER,
 *RADAR
 0044 " POLLUTION CONTROL, MONITORING, ESTUARIES, DETECTION, BIBLIOGRAPHIES
 0045 " NATURAL SEEPAGE, DETECTION, COASTAL WATERS, CANADA, ARCTIC
 0046 " EQUIPMENT, DESIGN-ENGINEERING, USCG, SURVEILLANCE, *AOSS II
 0047 " JAPAN, DISTRIBUTION, DETECTION, CONTAMINATION, *STRAITS OF TSURUSHIMA
 0048 " PETROLEUM PRODUCTS, CRUDE OIL, SOURCE IDENTIFICATION, *LASER FLOWSENSORS
 0049 " DETECTION, SIMULATIONS, *ALGORITHMS
 0050 " MONITORING, CONTAMINATION, SURVEILLANCE
 0582 " PHYSICAL ASPECTS, FATE, BEHAVIOR
 0256 REPRODUCTION, FUEL OIL, CRUDE OIL, BIRDS, *CASSINS AUKLETS
 0284 " CRUDE OIL, BIRDS, ACUTE EFFECTS, *FOOD INTAKE
 0325 " MORTALITY, FUEL OIL, BIRDS, *LAUGHING GULLS
 0373 " CRUDE OIL, BIOLOGICAL EFFECTS, *CORALS, *STILOPHORA PISTILLATA
 0387 " NORWAY, CRUDE OIL, CONTAMINATION, *GASTROPODS, *LITTORINA LITTOREA
 0388 " CONCENTRATIONS, ALGAE, TOXICITY
 0400 " FUEL OIL, BIRDS, TOXICITY, *JAPANESE QUAIL
 0446 RESOURCE MANAGEMENT, MARINE MAMMALS, LABRADOR SEA, FISHERIES, FISH, BIRDS, BIOLOGICAL
 EFFECTS, BASELINE STUDIES
 0624 " OCS, HABITATS, GEORGES BANK, FISHERIES, DRILLING, DEVELOPMENT, ATLANTIC COAST
 0648 " PRODUCTION, OIL-GAS LEASING, OFFSHORE, OCS, FISHERIES, ENVIRONMENTAL EFFECTS,
 DEVELOPMENT, SANTA BARBARA CHANNEL

0651 RESOURCE MANAGEMENT, OFFSHORE, LOUISIANA, EXPLOATION, ECOSYSTEMS, ECONOMICS,
 DEVELOPMENT, COASTAL WATERS
 0732 " REGULATIONS, REFINING, RECYCLING, INDUSTRIES, CONSERVATION, WASTE OIL
 0188 RESTORATION, CONTAMINATION, BEACHES, SHORELINES, SEDIMENTS
 0189 " BIRDS, *BIRD REHABILITATION
 0233 " RECOVERY, POLLUTION PREVENTION, OIL SPILLS, OIL REMOVAL, GROUNDWATER, DISPOSAL,
 CONTAMINATION
 0247 " POLLUTION PREVENTION, HABITATS, BIRDS, WILDLIFE
 0424 " RECLAMATION, ONSHORE, OIL SPILLS, NEW JERSEY, LAND FARMING, SOIL
 0618 REUSE, REFINERIES, OIL FIELDS, WASTE OIL, WASTEWATERS, WATER QUALITY, SOCIOECONOMIC
 EFFECTS, *BAVARIA, *BEER, *TOURISM
 0731 " REFINING, RECYCLING, LAND FARMING, FUEL OIL, DISPOSAL, WASTE OIL, *COMBUSTION
 0734 " REFINING, RECLAMATION, LEGISLATION, GOVERNMENT AGENCIES, DISPOSAL, WASTE OIL,
 *BUREAU OF MINES
 0736 " REGULATIONS, RECYCLING, LEGISLATION, ITALY, GERMANY, FRANCE, DENMARK, WASTE OIL,
 UK, US
 0013 RISK ANALYSIS, PLATFORMS, OIL FIELDS, OFFSHORE, MONITORING, SANTA BARBARA CHANNEL,
 *SEISMICITY
 0217 " LABRADOR SEA, CONTINGENCY PLANNING, BLOWOUTS
 0225 " OIL SPILLS, INFORMATION SYSTEMS, STATISTICS, USCG, *PIRS
 0253 " POLLUTION PREVENTION, NORWAY, NORTH SEA, CONTINGENCY PLANNING, SAFETY
 0566 " OIL SPILLS, OIL-GAS LEASING, OCS, GULF OF ALASKA
 0568 " PREDICTIONS, OIL SPILLS, OCS, ATLANTIC COAST, SEDIMENTS, SANTA BARBARA CHANNEL
 0659 " OCS, FISHERIES, DEVELOPMENT, ATLANTIC COAST
 0683 " PORTS, PACIFIC COAST, OIL TRANSPORT, OIL TRANSFER, ENVIRONMENTAL EFFECTS, CANADA
 0684 " PORTS, PACIFIC COAST, OIL TRANSPORT, OIL TRANSFER, ENVIRONMENTAL EFFECTS, CANADA
 0745 " PACIFIC COAST, OFFSHORE, OCS, DEVELOPMENT, ATLANTIC COAST, ALASKA, SAFETY, US,
 *ENVIRONMENTAL HAZARDS
 0105 RIVERS, OIL SHALE, OIL INDUSTRY, LAKES, CONCENTRATIONS, SAMPLING, WASTEWATERS, USSR,
 *ESTONIA
 0132 " PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, SPILL CONTAINMENT, *AIR BUBBLE
 DIVERTER
 0412 " LAKES, FRESHWATER, CONTAMINATION, AROMATIC HYDROCARBONS, ADSORPTION, ABSORPTION,
 SEDIMENTS
 0457 " POLLUTION CONTROL, ONSHORE, OFFSHORE, LIABILITY, DEVELOPMENT, COMPENSATION,
 SOURCES, UN, *UNEP CONVENTION
 0495 " GROUNDWATER, GASOLINE, UK, *AIRPORTS
 0519 " MICROORGANISMS, FRESHWATER, CRUDE OIL, BIODEGRADATION, ARCTIC, *MUTAGENIC ACTIVITY
 0597 " OIL SPILLS, COASTS, COASTAL ZONE MANAGEMENT, *VULNERABILITY INDEX
 0674 " PIPELINES, OIL SPILLS, LEAKAGE, TRANS-ALASKA PIPELINE
 0253 SAFETY, RISK ANALYSIS, POLLUTION PREVENTION, NORWAY, NORTH SEA, CONTINGENCY PLANNING
 0638 " PRODUCTION, PLATFORMS, OIL INDUSTRY, OFFSHORE, DEVELOPMENT, BLOWOUTS, SPILL
 RESPONSE, SPILL CLEANUP
 0644 " PREDICTIONS, ENVIRONMENTAL EFFECTS, DRILLING, CANADA, OFFSHORE, *LANCASTER SOUND
 0670 " POLLUTION PREVENTION, OIL DISCHARGES, DESIGN-ENGINEERING, TANKERS, SEGREGATED
 BALLAST
 0690 " REGULATIONS, POLLUTION PREVENTION, PERSONNEL TRAINING, OIL TRANSPORT, GUIDELINES,
 TANKERS, USCG
 0745 " RISK ANALYSIS, PACIFIC COAST, OFFSHORE, OCS, DEVELOPMENT, ATLANTIC COAST, ALASKA,
 US, *ENVIRONMENTAL HAZARDS
 0018 SAMPLING, MARINE ORGANISMS, HYDROCARBONS, GREENLAND, SEDIMENTS
 0029 " DETECTION, CHEMICAL ANALYSIS, BIOINDICATORS, BIOASSAY, WATER QUALITY
 0052 " HYDROCARBONS, FATE, DISTRIBUTION, CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES
 0056 " PAH, OCS, HYDROCARBONS, CHEMICAL ANALYSIS, ATLANTIC COAST, SEDIMENTS
 0059 " CONCENTRATIONS, COASTS, BEACHES, SEDIMENTS
 0060 " MEDITERRANEAN SEA, HYDROCARBONS, CONCENTRATIONS, TANKERS
 0062 " FRESHWATER, FISH, DISTRIBUTION, CONTAMINATION, CONCENTRATIONS, SEDIMENTS,
 VEGETATION, *TETRAALKYLLEAD COMPOUNDS
 0065 " MONITORING, DISTRIBUTION, CONCENTRATIONS, AFRICA, TAR
 0068 " MARINE ENVIRONMENT, HYDROCARBONS, DETECTION, SOURCES, *ATMOSPHERIC INPUTS
 0070 " PAH, CHROMATOGRAPHY, CHEMICAL ANALYSIS
 0071 " NORTH SEA, HYDROCARBONS, EKOFISK BLOWOUT, DETECTION, CONCENTRATIONS, SEAWATER
 0073 " MONITORING, AFRICA, SPECTROMETRY, SEDIMENTS
 0077 " HYDROCARBONS, DISTRIBUTION, CONCENTRATIONS, SEDIMENTS
 0083 " HYDROCARBONS, CONTAMINATION
 0085 " FRANCE, ENGLISH CHANNEL, ANALYTICAL TECHNIQUES, AMOCO CADIZ SPILL, SEAWATER,
 SEDIMENTS
 0086 " CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, AMOCO CADIZ SPILL, ZOOPLANKTON
 0093 " MONITORING, JAPAN, CONTAMINATION, SEAWATER
 0104 " OIL SPILLS, DETECTION, CONTAMINATION, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION
 0105 " RIVERS, OIL SHALE, OIL INDUSTRY, LAKES, CONCENTRATIONS, WASTEWATERS, USSR,
 *ESTONIA
 0106 " LAKES, DISTRIBUTION, SEDIMENTS, *SWITZERLAND, *AZAARENES
 0107 " PAH, LAKES, DISPERSION, AQUATIC ENVIRONMENT, SOURCES, SEDIMENTS
 0108 " HYDROCARBONS, CHEMICAL ANALYSIS, *FRACTIONATION

0109 SAMPLING, DETECTION, BIOGENIC HYDROCARBONS, AROMATIC HYDROCARBONS, ANIMALS, ANALYTICAL
 TECHNIQUES, ZOOPLANKTON
 0112 " PAH, ANALYTICAL TECHNIQUES, SOURCE IDENTIFICATION
 0113 " MEDITERRANEAN SEA, HYDROCARBONS, CONCENTRATIONS
 0115 " HYDROCARBONS, GC/MS, SOURCE IDENTIFICATION, WEATHERING
 0119 " OIL SPILLS, OIL DISCHARGES, CHROMATOGRAPHY, CHEMICAL ANALYSIS, SOURCE
 IDENTIFICATION, TANKERS, TAR
 0314 " PHYTOPLANKTON, HYDROCARBONS, GROWTH, DISTRIBUTION, BIOLOGICAL EFFECTS
 0482 " OIL-WATER SEPARATION, CHEMICAL ANALYSIS, SOURCE IDENTIFICATION, WASTEWATERS,
 *PROCEEDINGS
 0493 " MARINE ORGANISMS, FRANCE, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, COASTS, AMOCO CADIZ
 SPILL, *SPECIAL ISSUE
 0537 " PAH, MICROORGANISMS, FRESHWATER, BIODEGRADATION, *PHENANTHRENE
 0571 " NATURAL SEEPAGE, HYDROCARBONS, GULF OF MEXICO, CHEMICAL ANALYSIS, TAR
 0708 " REFINING, CONTAMINATION, CHEMICAL ANALYSIS, WASTEWATERS
 0709 " REFINING, EPA, WASTEWATERS, *PRIORITY POLLUTANTS
 0742 " HYDROCARBONS, DISPERSION, CONCENTRATIONS, SOLUBILITY, SEAWATER, *NISKIN VS.
 BLUMER SAMPLERS
 0013 SANTA BARBARA CHANNEL, RISK ANALYSIS, PLATFORMS, OIL FIELDS, OFFSHORE, MONITORING,
 *SEISMICITY
 0386 " NATURAL SEEPAGE, MICROORGANISMS, MARINE ORGANISMS, DISTRIBUTION, BIOLOGICAL
 EFFECTS, BENTHOS
 0568 " RISK ANALYSIS, PREDICTIONS, OIL SPILLS, OCS, ATLANTIC COAST, SEDIMENTS
 0595 " ONSHORE, OFFSHORE, NATURAL SEEPAGE, CALIFORNIA, TAR, *ASPHALT DEPOSITS
 0648 " RESOURCE MANAGEMENT, PRODUCTION, OIL-GAS LEASING, OFFSHORE, OCS, FISHERIES,
 ENVIRONMENTAL EFFECTS, DEVELOPMENT
 0695 " PRODUCTION, PORTS, PACIFIC COAST, OIL TRANSPORT, OCS, DEVELOPMENT, SHIPS, TANKERS
 0275 SCOTLAND, OIL SPILLS, MARINE ORGANISMS, FUEL OIL, COASTS, BIRDS
 0036 SEA SURFACE, REMOTE SENSING, OIL SLICKS, CONTAMINATION, *LASER RADAR
 0417 " PHYSICAL ASPECTS, MOVEMENT, FATE, BLOWOUTS, BEHAVIOR, SEAWATER
 0545 " PHYSICAL ASPECTS, OIL SLICKS, BEHAVIOR, *SUNLIGHT GLITTER
 0549 " OIL SLICKS, DRIFT, BEHAVIOR, SPREADING
 0589 " OIL SPILLS, MICROORGANISMS, FATE, DISPERSION, BIODEGRADATION, WEATHERING,
 SEDIMENTATION
 0020 SEAWATER, HYDROCARBONS, DETECTION, CONCENTRATIONS, CANADA, ARCTIC, SEDIMENTS, *BREFFIN
 BAY
 0021 " HYDROCARBONS, ANALYTICAL TECHNIQUES, *FLUORESCENCE SPECTROPHOTOMETRY
 0023 " ENGLISH CHANNEL, DETECTION, CONCENTRATIONS, AMOCO CADIZ SPILL, SPECTROMETRY, WSP
 0030 " HYDROCARBONS, CANADA, ARCTIC, *HARLOT BASIN
 0053 " CRUDE OIL, CONCENTRATIONS, CHROMATOGRAPHY, AROMATIC HYDROCARBONS, ANALYTICAL
 TECHNIQUES
 0055 " MARINE ORGANISMS, CRUDE OIL, BIOLOGICAL EFFECTS, SOLUTION, WSP
 0057 " HYDROCARBONS, GEORGES BANK, CHEMICAL ANALYSIS, ATLANTIC OCEAN
 0061 " CRUDE OIL, CHEMICAL ANALYSIS, AMOCO CADIZ SPILL, WSP
 0063 " CHEMICAL ANALYSIS, SPECTROSCOPY
 0071 " SAMPLING, NORTH SEA, HYDROCARBONS, *TROPISK BLOWOUT, DETECTION, CONCENTRATIONS
 0079 " GASOLINE, FRESHWATER, ECOSYSTEMS, CRUDE OIL, CONTAMINATION, BIODEGRADATION,
 BACTERIA, ARCTIC, STATISTICAL ANALYSIS
 0085 " SAMPLING, FRANCE, ENGLISH CHANNEL, ANALYTICAL TECHNIQUES, AMOCO CADIZ SPILL,
 SEDIMENTS
 0089 " HYDROCARBONS, FRANCE, CONCENTRATIONS, COASTS, BAYS, AMOCO CADIZ SPILL
 0093 " SAMPLING, MONITORING, JAPAN, CONTAMINATION
 0098 " MARINE ENVIRONMENT, HYDROCARBONS, BIODEGRADATION, BACTERIA, ATLANTIC OCEAN,
 SEDIMENTS, *SCREENING
 0111 " PAH, MARINE ORGANISMS, DETECTION, ANALYTICAL TECHNIQUES, SEDIMENTS
 0296 " JAPAN, CONTAMINATION, BIODEGRADATION, BACTERIA, STATISTICAL ANALYSIS
 0298 " MICROORGANISMS, CONTAMINATION, BACTERIA, *SURVIVAL
 0346 " HYDROCARBONS, CONTAMINATION, ANNELIDS, SEDIMENTS, UPTAKE, *RELEASE, *AERINICOLA
 MARINA, *NAPHTHALENE
 0358 " JAPAN, HYDROCARBONS, BIODEGRADATION, BACTERIA, SEDIMENTS, STATISTICAL ANALYSIS
 0413 " ICE, COLD CLIMATES, ARCTIC, *PERMEABILITY
 0417 " SEA SURFACE, PHYSICAL ASPECTS, MOVEMENT, FATE, BLOWOUTS, BEHAVIOR
 0491 " MONITORING, MICROORGANISMS, FISH, FATE, BIRDS, BIODEGRADATION, BEHAVIOR, AMOCO
 CADIZ SPILL, SEDIMENTS, TOXICITY
 0526 " PHYSICAL EFFECTS, HYDROCARBONS, EQUIPMENT, CRUDE OIL, BIODEGRADATION, BACTERIA,
 TAR SANDS, *TEMPERATURE
 0578 " MARINE ENVIRONMENT, HYDROCARBONS, FATE, DISPERSION, SEDIMENTS
 0742 " SAMPLING, HYDROCARBONS, DISPERSION, CONCENTRATIONS, SOLUBILITY, *NISKIN VS.
 BLUMER SAMPLERS
 0404 SEDIMENTATION, INTERTIDAL ZONE, ENVIRONMENTAL EFFECTS, BENTHOS, AMOCO CADIZ SPILL,
 *STABED PENETRATION
 0406 " PHYSICAL EFFECTS, INTERTIDAL ZONE, FRANCE, DISTRIBUTION, COASTS, AMOCO CADIZ
 SPILL, SHORELINES
 0409 " OIL SPILLS, COASTS, ALASKA, *COASTAL MORPHOLOGY, *POTENTIAL SPILL IMPACTS
 0411 " INTERTIDAL ZONE, FRANCE, FATE, BEACHES, AMOCO CADIZ SPILL, SEDIMENTS, SHORELINES

0415 SEDIMENTATION, INTERTIDAL ZONE, DISTRIBUTION, CRUDE OIL, BEACHES, SPAIN, URQUIOLA SPILL
 0418 " BEHAVIOR, AMOCO CADIZ SPILL, SEDIMENTS, WEATHERING, TOXICITY
 0512 " ENVIRONMENTAL EFFECTS, COASTS, BEHAVIOR, AMOCO CADIZ SPILL, ACUTE EFFECTS
 0589 " SEA SURFACE, OIL SPILLS, MICROORGANISMS, FATE, DISPERSION, BIODEGRADATION,
 WEATHERING
 0616 " PRODUCTION, OFFSHORE, METABOLISM, MARINE ORGANISMS, FOOD WEB, SEDIMENTS, UPTAKE,
 *HEAVY METALS
 0009 SEDIMENTS, PAH, DETECTION, COASTS, CANADA, SOURCE IDENTIFICATION, *SHELLFISH,
 *CREOSOTE, *WHARF STRUCTURES
 0018 " SAMPLING, MARINE ORGANISMS, HYDROCARBONS, GREENLAND
 0020 " SEAWATER, HYDROCARBONS, DETECTION, CONCENTRATIONS, CANADA, ARCTIC, *BAFFIN BAY
 0031 " PAH, HYDROCARBONS, GC/MS, ESTUARIES, DISTRIBUTION, *DIATOMS
 0056 " SAMPLING, PAH, OCS, HYDROCARBONS, CHEMICAL ANALYSIS, ATLANTIC COAST
 0059 " SAMPLING, CONCENTRATIONS, COASTS, BEACHES
 0062 " SAMPLING, FRESHWATER, FISH, DISTRIBUTION, CONTAMINATION, CONCENTRATIONS,
 VEGETATION, *TETRAALKYLL LEAD COMPOUNDS
 0073 " SAMPLING, MONITORING, AFRICA, SPECTROMETRY
 0074 " MARINE ENVIRONMENT, HYDROCARBONS, CONCENTRATIONS, CHEMICAL ANALYSIS, *NATIONAL
 BUREAU OF STANDARDS
 0076 " HYDROCARBONS, DETECTION, CHEMICAL ANALYSIS, *INTERLABORATORY COMPARISON
 0077 " SAMPLING, HYDROCARBONS, DISTRIBUTION, CONCENTRATIONS
 0078 " HYDROCARBONS, CONCENTRATIONS, CHROMATOGRAPHY, CHEMICAL ANALYSIS, ARGO MERCHANT
 SPILL, *UV FLUORESCENCE
 0081 " GULF OF ALASKA, CHEMICAL ANALYSIS, BERING SEA, BEAUFORT SEA
 0082 " GULF OF ALASKA, CHROMATOGRAPHY, CHEMICAL ANALYSIS, BERING SEA
 0084 " PAH, DISTRIBUTION, CONCENTRATIONS, SOURCES, *COMBUSTION, *URBAN CENTERS
 0085 " SEAWATER, SAMPLING, FRANCE, ENGLISH CHANNEL, ANALYTICAL TECHNIQUES, AMOCO CADIZ
 SPILL
 0090 " PORTS, JAPAN, CONTAMINATION, CHEMICAL ANALYSIS, *OSAKA PORT
 0094 " GC/MS, DISTRIBUTION, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, SOURCES
 0098 " SEAWATER, MARINE ENVIRONMENT, HYDROCARBONS, BIODEGRADATION, BACTERIA, ATLANTIC
 OCEAN, *SCREENING
 0100 " HYDROCARBONS, FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS
 0106 " SAMPLING, LAKES, DISTRIBUTION, *SWITZERLAND, *AZAARENES
 0107 " SAMPLING, PAH, LAKES, DISPERSION, AQUATIC ENVIRONMENT, SOURCES
 0111 " SEAWATER, PAH, MARINE ORGANISMS, DETECTION, ANALYTICAL TECHNIQUES
 0124 " PAH, MARINE ENVIRONMENT, GROUNDWATER, GC/MS, FRESHWATER, SOURCE IDENTIFICATION
 0127 " PAH, WAMWAGANSETT BAY, ESTUARIES, DISTRIBUTION, SOURCE IDENTIFICATION
 0147 " PATENT, EQUIPMENT, BEACH CLEANUP, *CRYOGENIC METHOD
 0188 " RESTORATION, CONTAMINATION, BEACHES, SEACELINES
 0265 " MOLLUSKS, ESTUARIES, CRUDE OIL, CONTAMINATION, CHRONIC EFFECTS, *BIOMASS, *OYSTERS
 0287 " PLANTS, MARSHES, GROWTH, CRUDE OIL, *SPARTINA ALTERNIFLORA
 0346 " SEAWATER, HYDROCARBONS, CONTAMINATION, ANNELIDS, UPTAKE, *RELZAR, *ARENICOLA
 MARINA, *NAPHTHALENE
 0358 " SEAWATER, JAPAN, HYDROCARBONS, BIODEGRADATION, BACTERIA, STATISTICAL ANALYSIS
 0397 " MICROORGANISMS, BIOLOGICAL EFFECTS, *MICROBIAL ACTIVITY
 0408 " DISPERSANTS, CRUDE OIL, CONTAMINATION, BEACHES, ADSORPTION
 0411 " SEDIMENTATION, INTERTIDAL ZONE, FRANCE, FATE, BEACHES, AMOCO CADIZ SPILL,
 SHORELINES
 0412 " RIVERS, LAKES, FRESHWATER, CONTAMINATION, AROMATIC HYDROCARBONS, ADSORPTION,
 ABSORPTION
 0418 " SEDIMENTATION, BEHAVIOR, AMOCO CADIZ SPILL, WEATHERING, TOXICITY
 0426 " OCS, MARINE ORGANISMS, HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA, UPTAKE
 0427 " OCS, MARINE ORGANISMS, HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA, UPTAKE
 0428 " OCS, MARINE ORGANISMS, HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA, UPTAKE
 0430 " OCS, BIOMASS, BIOINDICATORS, BENTHOS, BASELINE STUDIES, ALASKA
 0433 " OCS, MICROORGANISMS, CRUDE OIL, BIODEGRADATION, BEAUFORT SEA, BASELINE STUDIES,
 ALASKA
 0464 " OIL FIELDS, MARINE ORGANISMS, HYDROCARBONS, CONCENTRATIONS, BENTHOS, WASTEWATERS,
 TEXAS, *BRINES
 0474 " PLANTS, MARINE ORGANISMS, COASTAL WATERS, AMOCO CADIZ SPILL, SHORELINES
 0491 " SEAWATER, MONITORING, MICROORGANISMS, FISH, FATE, BIRDS, BIODEGRADATION, BEHAVIOR,
 AMOCO CADIZ SPILL, TOXICITY
 0525 " PAH, MICROORGANISMS, COASTAL WATERS, BIODEGRADATION, BENTHOS, ANNELIDS,
 *POLYCHAETE WORMS
 0543 " PETROLEUM PRODUCTS, MOVEMENT, HYDROCARBONS, FATE, ATLANTIC OCEAN, *NEW YORK BIGHT
 0551 " PAH, FATE, CONCENTRATIONS, CHEMICAL EFFECTS, BATS, SOURCES, WASHINGTON,
 COOPLANKTON, *FECAL PELLETS
 0563 " SANTA BARBARA CHANNEL, RISK ANALYSIS, PREDICTIONS, OIL SPILLS, OCS, ATLANTIC COAST
 0576 " MODELS, HYDROCARBONS, FATE, CONTAMINATION, ARGO MERCHANT SPILL, TOXICITY
 0578 " SEAWATER, MARINE ENVIRONMENT, HYDROCARBONS, FATE, DISPERSION
 0616 " SEDIMENTATION, PRODUCTION, OFFSHORE, METABOLISM, MARINE ORGANISMS, FOOD WEB,
 UPTAKE, *HEAVY METALS
 0670 SEGREGATED BALLAST, SAFETY, POLLUTION PREVENTION, OIL DISCHARGES, DESIGN-ENGINEERING,
 TANKERS

0695 SEGREGATED BALLAST, PORTS, POLLUTION CONTROL, OIL DISCHARGES, BALLAST, TANKERS,
 *LOAD ON TOP METHOD
 0184 SHIPS, OIL-WATER SEPARATION, EQUIPMENT, SPILL CLEANUP, SKIMMERS
 0194 " OIL SPILLS, NEW YORK, HARBORS, BAYS, SPILL CLEANUP
 0513 " OIL SPILLS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, BEHAVIOR, STATISTICS, SPILL
 CLEANUP, TANKERS, SPILL CONTAINMENT, *GENERAL REVIEW
 0640 " OFFSHORE, MARINE ENVIRONMENT, ENVIRONMENTAL EFFECTS, DEVELOPMENT, COASTAL WATERS,
 UN, *PROCEEDINGS
 0665 " POLLUTION CONTROL, PERSONNEL TRAINING, OIL TRANSPORT, OIL DISCHARGES,
 INTERNATIONAL AGREEMENTS, EQUIPMENT, TANKERS
 0669 " HARBORS, TANKERS, TEXAS, *M/V AMCO SCEPTER COLLISION
 0696 " PORTS, HARBORS, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, TEXAS, *ENVIRONMENTAL
 MANAGEMENT
 0691 " OIL SPILLS, OFFSHORE, INFORMATION SYSTEMS, FRANCE, DRILLING, TANKERS, SOURCES,
 *DATA BANK, *ACCIDENTS
 0694 " OIL SPILLS, NEW JERSEY, FISHERIES, *TOURISM
 0695 " SANTA BARBARA CHANNEL, PRODUCTION, PORTS, PACIFIC COAST, OIL TRANSPORT, OCS,
 DEVELOPMENT, TANKERS
 0006 SHOPELINES, MONITORING, HYDROCARBONS, CONTAMINATION, *HONG KONG
 0025 " MONITORING, ENVIRONMENTAL EFFECTS, COASTS, *ROCKY SEASHORES
 0039 " REMOTE SENSING, FRANCE, DETECTION
 0188 " SEDIMENTS, RESTORATION, CONTAMINATION, BRANCHES
 0197 " MANUALS, CONTINGENCY PLANNING, BEAUFORT SEA, ARCTIC, SPILL CLEANUP, SPILL RESPONSE
 0406 " SEDIMENTATION, PHYSICAL EFFECTS, INTERTIDAL ZONE, FRANCE, DISTRIBUTION, COASTS,
 AMOCO CADIZ SPILL
 0411 " SEDIMENTS, SEDIMENTATION, INTERTIDAL ZONE, FRANCE, FATE, BEACHES, AMOCO CADIZ SPILL
 0419 " CONTAMINATION, AMOCO CADIZ SPILL, TOXICITY, WEATHERING
 0474 " SEDIMENTS, PLANTS, MARINE ORGANISMS, COASTAL WATERS, AMOCO CADIZ SPILL
 0475 " FRANCE, ENVIRONMENTAL EFFECTS, COASTS, AMOCO CADIZ SPILL, STATISTICS
 0485 " OIL SPILLS, ENVIRONMENTAL EFFECTS, COASTAL WATERS, BAYS, ALASKA, *VULNERABILITY
 INDEX
 0567 " ENVIRONMENTAL EFFECTS, DISPERSANTS, COASTAL WATERS, ARCTIC, *EXPERIMENTAL SPILLS
 0049 SIMULATIONS, REMOTE SENSING, DETECTION, *ALGORITHMS
 0199 " INFORMATION SYSTEMS, EQUIPMENT, CONTINGENCY PLANNING, SPILL RESPONSE, USCG,
 STATISTICAL ANALYSIS, *LOGISTICS
 0282 " MOLLUSKS, ESTUARIES, ECOSYSTEMS, CRUSTACEANS, CRUDE OIL, CHRONIC EFFECTS,
 *OYSTERS, *SHRIMP, *ENZYME ACTIVITIES
 0283 " FISH, ESTUARIES, ECOSYSTEMS, CRUDE OIL, CHRONIC EFFECTS, *STRIPED MULLET, *ENZYME
 ACTIVITIES
 0559 " LABRADOR SEA, CONTINGENCY PLANNING, CANADA, BLOWOUTS, BASELINE STUDIES, SPILL
 RESPONSE
 0562 " OIL INDUSTRY, ICE, FATE, BEHAVIOR, *PACK ICE, *APOA
 0569 " BEHAVIOR, SPILL TRAJECTORIES
 0139 SKIMMERS, PRODUCT INFORMATION, PERFORMANCE TESTING, SPILL CLEANUP, *BRAVO BLOWOUT
 0140 " EQUIPMENT, BOOMS, BEACH CLEANUP, SPILL CLEANUP
 0144 " SHIPS, OIL-WATER SEPARATION, EQUIPMENT, SPILL CLEANUP
 0149 " PERFORMANCE TESTING, EQUIPMENT, COLD CLIMATES, SPILL CLEANUP
 0158 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP
 0168 " PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT,
 SPILL CLEANUP, UK
 0175 " PATENT, GRAVITY SEPARATION, EQUIPMENT, SPILL CLEANUP
 0177 " PATENT, OIL-WATER SEPARATION, EQUIPMENT, SPILL CLEANUP, WASTEWATERS
 0179 " PRODUCT INFORMATION, PERFORMANCE TESTING, EQUIPMENT, SPILL CLEANUP
 0179 " PERFORMANCE TESTING, DESIGN-ENGINEERING, COLD CLIMATES, CANADA, ARCTIC, SPILL
 CLEANUP, *ANOP
 0183 " PRODUCT INFORMATION, PERFORMANCE TESTING, EQUIPMENT, SPILL CLEANUP
 0185 " PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, SPILL CLEANUP, *WRINGER
 0187 " RECOVERY, PERFORMANCE TESTING, OIL-WATER SEPARATION, EQUIPMENT, SPILL *PUMPS
 0198 " POLLUTION CONTROL, DISPERSION, SPILL CLEANUP, TANKERS, *OIL STRANDING
 0208 " EQUIPMENT, BOOMS, SPILL CONTAINMENT, SPILL CLEANUP, *DEPLOYMENT METHODS
 0182 SLUDGE, PETROCHEMICALS, INCINERATION, DESIGN-ENGINEERING, SPILL CLEANUP,
 *DETOXIFICATION, *RESIDUAL OILS
 0520 " REFINERIES, LAND FARMING, DISPOSAL, BIODEGRADATION, SOIL, STORAGE
 0521 " LAND FARMING, GROUNDWATER, BIODEGRADATION, SOIL, *LEACHATES
 0702 " REFINERIES, OIL-WATER SEPARATION, FLOCCULATION, CONTAMINATION, BIODEGRADATION,
 WASTEWATER TREATMENT
 0726 " OIL REMOVAL, INDUSTRIES, BIOLOGICAL TREATMENT, WASTEWATER TREATMENT
 0421 SOCIOECONOMIC EFFECTS, CONTINGENCY PLANNING, SPILL CLEANUP
 0423 " CONTINGENCY PLANNING, USCG, ST. LAWRENCE RIVER, SPILL RESPONSE, *VERCO 140 SPILL
 0471 " HEALTH HAZARDS, ENVIRONMENTAL EFFECTS, DISPERSANTS, *PENN AR BED JOURNAL
 0618 " BEUSE, REFINERIES, OIL FIELDS, WASTE OIL, WASTEWATERS, WATER QUALITY, *BATAVIA,
 *BEER, *TOURISM
 0620 " OFFSHORE, EXPLORATION, *ECONOMICS, DRILLING, CANADA
 0634 " OFFSHORE IMPACTS, OIL SPILLS, ENVIRONMENTAL EFFECTS, DRILLING, COASTS

0635 SOCIOECONOMIC EFFECTS, OIL INDUSTRY, MARINE ORGANISMS, FISHERIES, FISH, ENVIRONMENTAL
EFFECTS, CRUDE OIL, COST ANALYSIS

0636 " OIL SHALE, HABITATS, ENVIRONMENTAL EFFECTS, WATER QUALITY, WILDLIFE

0649 " OIL INDUSTRY, OFFSHORE, OCS, LOUISIANA, GULF OF MEXICO, FISHERIES, ENVIRONMENTAL
EFFECTS

0165 SOIL, CRUDE OIL, BURNING, BEACH CLEANUP, SORBENTS, *RESIDUAL OILS, *SINKING

0344 " METABOLISM, BIOLOGICAL EFFECTS, ARCTIC, VEGETATION, *TUNDRA, *POOTS, *SOIL
CELLULOSE

0378 " MICROORGANISMS, CRUDE OIL, BIOLOGICAL EFFECTS, ARCTIC, *DENITRIFICATION, *NITROGEN
FIXATION

0385 " FUNGI, CRUDE OIL, BIOLOGICAL EFFECTS, BACTERIA, ALASKA, *HOT OIL, *TAIGA SOIL

0424 " RESTORATION, RECLAMATION, ONSHORE, OIL SPILLS, NEW JERSEY, LAND FARMING

0520 " SLUDGE, REFINERIES, LAND FARMING, DISPOSAL, BIODEGRADATION, STORAGE

0521 " SLUDGE, LAND FARMING, GROUNDWATER, BIODEGRADATION, *LEACHATES

0527 " PETROLEUM PRODUCTS, ONSHORE, BIODEGRADATION, BACTERIA, *ROADSIDE ENVIRONMENTS,
*HIGHWAY RUNOFF

0529 " PLANTS, LAND FARMING, FATS, CRUDE OIL, CONTAMINATION, BIODEGRADATION, ALASKA

0530 " HYDROCARBONS, CRUDE OIL, CHEMICAL ANALYSIS, BIODEGRADATION, BACTERIA

0536 " MICROORGANISMS, FATS, CRUDE OIL, BIOLOGICAL EFFECTS, BIODEGRADATION, ARCTIC,
*TUNDRA

0699 " PLANTS, LAND FARMING, EMULSIONS, DISPOSAL, WASTE OIL, TOXICITY

0719 " PLANTS, LAND FARMING, DISPOSAL, WASTE OIL

0720 " PLANTS, MONITORING, LAND FARMING, FUEL OIL, DISPOSAL, CRUDE OIL, CRANKCASE OIL,
BIOLOGICAL EFFECTS, WASTE OIL

0724 " LAND FARMING, DISPOSAL, WASTE OIL, *LEACHING TEST

0169 SOLID WASTES, INCINERATION, SPILL DISPOSAL

0705 " REFINERIES, ACTIVATED SLUDGE, WASTEWATER TREATMENT, *ACTIVATED CARBON

0706 " REFINERIES, ACTIVATED SLUDGE, WASTEWATER TREATMENT, *ACTIVATED CARBON

0707 " REFINERIES, ACTIVATED SLUDGE, WASTEWATER TREATMENT, *ACTIVATED CARBON

0723 " REFINING, EXTRACTION, WASTEWATER TREATMENT, ENVIRONMENTAL EFFECTS

0725 " INCINERATION, SPILL CLEANUP, WASTEWATERS, *DETOXIFICATION

0742 SOLUBILITY, SEAWATER, SAMPLING, HYDROCARBONS, DISPERSION, CONCENTRATIONS, *WISKEY VS.
BLUNDER SAMPLERS

0055 SOLUTION, SEAWATER, MARINE ORGANISMS, CRUDE OIL, BIOLOGICAL EFFECTS, WSY

0141 SORBENTS, PERFORMANCE TESTING, EQUIPMENT, SPILL CLEANUP, SPILL REMOVAL, TK,
*POLYPROPYLENE MOP

0143 " PERFORMANCE TESTING, SPILL CLEANUP, SWEDEN, *BREGOIL

0146 " PATENT, ADSORPTION, SPILL CLEANUP, *FIBER MATS

0148 " PATENT, OIL REMOVAL, ADSORPTION, *CCIR DUST

0160 " OIL SLICKS, EQUIPMENT, SPILL REMOVAL, *FOAM STRIPS

0163 " PATENT, ADSORPTION, SPILL REMOVAL, *PERLITE

0165 " SOIL, CRUDE OIL, BURNING, BEACH CLEANUP, *RESIDUAL OILS, *SINKING

0170 " PATENT, OIL-WATER SEPARATION, ADSORPTION, WASTEWATER TREATMENT, *KAPON FIBRES

0345 " PRODUCT INFORMATION, PERFORMANCE TESTING, MARINE ORGANISMS, ADSORPTION, TOXICITY

0727 " PATENT, OIL-WATER SEPARATION, OIL REMOVAL

0728 " PRODUCT INFORMATION, OIL-WATER SEPARATION, OIL REMOVAL, FILTRATION, COALESCENCE,
*MODIFIED PEAT

0744 " MARSHES, ADSORPTION, VEGETATION, *OILY HERBICIDE SPILLS

0009 SOURCE IDENTIFICATION, SEDIMENTS, PAH, DETECTION, COASTS, CANADA, *SHELLFISH,
*CHITOSAN, *WEAR STRUCTURES

0010 " OIL SPILLS, MARINE ENVIRONMENT

0034 " REMOTE SENSING, OIL SLICKS, CANADA, ANALYTICAL TECHNIQUES, *FLUOROSCENCE

0037 " REMOTE SENSING, OIL SPILLS, STATISTICAL ANALYSIS

0048 " REMOTE SENSING, PETROLEUM PRODUCTS, CRUDE OIL, *LASER FLUORESCENCE

0104 " SAMPLING, OIL SPILLS, DETECTION, CONTAMINATION, CHEMICAL ANALYSIS

0112 " SAMPLING, PAH, ANALYTICAL TECHNIQUES

0114 " OIL INDUSTRY, OFFSHORE, NATURAL SEEPAGE, STATISTICS, TANKERS, INLAND

0115 " SAMPLING, HYDROCARBONS, GC/MS, WEATHERING

0116 " CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES, WEATHERING, SPECTROSCOPY, *CORRELATION
COEFFICIENTS

0117 " OIL SPILLS, CHEMICAL ANALYSIS

0118 " OIL SPILLS, ANALYTICAL TECHNIQUES, WEATHERING, USCG, *COMPUTERIZED PATTERN
RECOGNITION

0119 " SAMPLING, OIL SPILLS, OIL DISCHARGES, CHROMATOGRAPHY, CHEMICAL ANALYSIS, TANKERS,
TAR

0120 " OIL SPILLS, MODELS, INFORMATION SYSTEMS, ANALYTICAL TECHNIQUES, *PATTERN
RECOGNITION

0121 " FUEL OIL, ANALYTICAL TECHNIQUES, SPECTROMETRY

0122 " CHROMATOGRAPHY, ANALYTICAL TECHNIQUES, SPECTROSCOPY

0123 " OIL SPILLS, CHEMICAL ANALYSIS, *SULFUR ISOTOPES

0124 " SEDIMENTS, PAH, MARINE ENVIRONMENT, GROUNDWATER, GC/MS, FRESHWATER

0125 " HYDROCARBONS, CHROMATOGRAPHY, *URBAN RUNOFF

0126 " OIL DISCHARGES, INDUSTRIES, HYDROCARBONS, ESTUARIES, UK, *VOLATILE FRACTIONS

0127 " SEDIMENTS, PAH, NARRAGANSETT BAY, ESTUARIES, DISTRIBUTION

0128 " MARINE ORGANISMS, HYDROCARBONS, DETECTION, BIOGENIC HYDROCARBONS

0129 SOURCE IDENTIFICATION, NATURAL SEEPAGE, MONITORING, CRUDE OIL, CHEMICAL ANALYSIS, *STATISTICS

0130 * INDUSTRIES, ESTUARIES, DELAWARE, CONTAMINATION

0482 * SAMPLING, OIL-WATER SEPARATION, CHEMICAL ANALYSIS, WASTEWATERS, *PROCEEDINGS

0557 * HYDROCARBONS, GROUNDWATER, DISPERSION

0713 * MONITORING, WASTEWATERS, WASTE OIL, *BASE EARTH TAGGING

0068 SOURCES, SAMPLING, MARINE ENVIRONMENT, HYDROCARBONS, DETECTION, *ATMOSPHERIC INPUTS

0084 * SEDIMENTS, PAH, DISTRIBUTION, CONCENTRATIONS, *COMBUSTION, *URBAN CENTERS

0094 * SEDIMENTS, GC/MS, DISTRIBUTION, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS

0107 * SEDIMENTS, SAMPLING, PAH, LAKES, DISPERSION, AQUATIC ENVIRONMENT

0110 * EFFLUENTS, HYDROCARBONS, ESTUARIES, CRANKCASE OIL, CONTAMINATION, CONCENTRATIONS, WASTEWATERS, *URBAN RUNOFF

0235 * OFFSHORE, CONTINGENCY PLANNING, STATISTICS, SPILL RESPONSE, TANKERS, *USFWS

0457 * RIVERS, POLLUTION CONTROL, ONSHORE, OFFSHORE, LIABILITY, DEVELOPMENT, COMPENSATION, *UNEP CONVENTION

0470 * FATE, CONTAMINATION, BOOK REVIEW, BIODEGRADATION, AQUATIC ENVIRONMENT, ANALYTICAL TECHNIQUES

0506 * MARINE ORGANISMS, MARINE ENVIRONMENT, HYDROCARBONS, GULF OF MEXICO, CONCENTRATIONS, CHEMICAL ANALYSIS, TOXICITY, *VOLATILE LIQUID FRACTIONS

0551 * SEDIMENTS, PAH, FATE, CONCENTRATIONS, CHEMICAL EFFECTS, BAYS, WASHINGTON, COOPLANKTON, *FUCAL PELLETS

0631 * SHIPS, OIL SPILLS, OFFSHORE, INFORMATION SYSTEMS, FRANCE, DRILLING, TANKERS, *DATA BANK, *ACCIDENTS

0415 SPAIN, SEDIMENTATION, INTERTIDAL ZONE, DISTRIBUTION, CRUDE OIL, BEACHES, TEQUILA SPILL

0023 SPECTROSCOPY, SEAWATER, ENGLISH CHANNEL, DETECTION, CONCENTRATIONS, AMOCO CADIZ SPILL, *NSF

0073 * SEDIMENTS, SAMPLING, MONITORING, AFRICA

0121 * SOURCE IDENTIFICATION, FUEL OIL, ANALYTICAL TECHNIQUES

0063 SPECTROSCOPY, SEAWATER, CHEMICAL ANALYSIS

0064 * HYDROCARBONS, CHROMATOGRAPHY, BIRDS, ANALYTICAL TECHNIQUES, *MALLARD DUCKS

0102 * CONTAMINATION, CHEMICAL ANALYSIS

0116 * SOURCE IDENTIFICATION, CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES, WEATHERING, *CORRELATION COEFFICIENTS

0122 * SOURCE IDENTIFICATION, CHROMATOGRAPHY, ANALYTICAL TECHNIQUES

0139 SPILL CLEANUP, OIL SLICKS, EQUIPMENT, SPILL RESPONSE, *IHC SLICKTRAIL

0139 * SKIMMERS, PRODUCT INFORMATION, PERFORMANCE TESTING, *BRAVO BLOWOUT

0140 * SKIMMERS, EQUIPMENT, BOOMS, BEACH CLEANUP

0141 * SORBENTS, PERFORMANCE TESTING, EQUIPMENT, SPILL REMOVAL, UK, *POLYPROPYLENE FOP

0142 * PRODUCT INFORMATION, OIL-WATER SEPARATION, OIL REMOVAL

0143 * SORBENTS, PERFORMANCE TESTING, SWEDEN, *BREGOIL

0144 * SKIMMERS, SHIPS, OIL-WATER SEPARATION, EQUIPMENT

0145 * OIL INDUSTRY, LEGISLATION, *ECONOMICS, US GOVERNMENT

0146 * SORBENTS, PATENT, ADSORPTION, *FIBER MATS

0149 * SKIMMERS, PERFORMANCE TESTING, EQUIPMENT, COLD CLIMATES

0151 * OIL SPILLS, *GELATION

0152 * MODELS, GUIDELINES, BIBLIOGRAPHIES, SPILL DISPOSAL

0153 * MANUALS, GUIDELINES, DISPERSANTS, SPILL RESPONSE

0154 * PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, ADSORPTION

0156 * PERFORMANCE TESTING, DISPERSANTS, SPILL REMOVAL, *FEASIBILITY STUDIES, *ARRIVAL APPLICATION

0158 * SKIMMERS, PATENT, EQUIPMENT, DESIGN-ENGINEERING

0159 * PERSONNEL TRAINING, MANUALS, GUIDELINES, CONTINGENCY PLANNING, SPILL RESPONSE

0162 * MANUALS, GUIDELINES, DISPERSANTS, SPILL RESPONSE

0164 * PERFORMANCE TESTING, INCINERATION, EQUIPMENT, *KURDISTAN SPILL

0168 * SKIMMERS, PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL CONTAINMENT, *IN

0171 * EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING, AMOCO CADIZ SPILL, SPILL RESPONSE

0174 * DISPERSANTS, *RESIDUAL OILS

0175 * SKIMMERS, PATENT, GRAVITY SEPARATION, EQUIPMENT

0177 * SKIMMERS, PATENT, OIL-WATER SEPARATION, EQUIPMENT, WASTEWATERS

0179 * SKIMMERS, PRODUCT INFORMATION, PERFORMANCE TESTING, EQUIPMENT

0179 * SKIMMERS, PERFORMANCE TESTING, DESIGN-ENGINEERING, COLD CLIMATES, CANADA, ARCTIC, *ANOP

0180 * REGULATIONS, PERSONNEL TRAINING, DISPERSANTS, SPILL COOPERATIVES

0182 * SLUDGE, PETROCHEMICALS, INCINERATION, DESIGN-ENGINEERING, *DETOXIFICATION, *RESIDUAL OILS

0183 * SKIMMERS, PRODUCT INFORMATION, PERFORMANCE TESTING, EQUIPMENT

0185 * SKIMMERS, PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, *WINGERS

0190 * PERSONNEL TRAINING, PERFORMANCE TESTING, OIL INDUSTRY, EQUIPMENT, DISPERSANTS, CALIFORNIA, *SCG

0191 * PERSONNEL TRAINING, OIL REMOVAL, EQUIPMENT, CONTINGENCY PLANNING

0194 * SHIPS, OIL SPILLS, NEW YORK, HARBORS, BAYS

0197 * SHORELINES, MANUALS, CONTINGENCY PLANNING, BEAUFORT SEA, ARCTIC, SPILL RESPONSE

0198 * SKIMMERS, POLLUTION CONTROL, DISPERSION, TANKERS, *OIL STRANDING

0208 * SKIMMERS, EQUIPMENT, BOOMS, SPILL CONTAINMENT, *DEPLOYMENT METHODS

0213 SPILL CLEANUP, EQUIPMENT, CONTINGENCY PLANNING, SPILL RESPONSE
 0219 " ICE, CANADA, BEAUFORT SEA, ATLANTIC COAST, ARCTIC, SPILL RESPONSE, *WORKSHOP
 OPINION SURVEY
 0227 " REGULATIONS, LIABILITY
 0229 " POLLUTION PREVENTION, GOVERNMENT AGENCIES, DISPERSANTS, SPILL CONTAINMENT, UK
 0232 " POLLUTION PREVENTION, POLLUTION CONTROL, EQUIPMENT, BLOWOUT PREVENTION,
 BIBLIOGRAPHIES
 0238 " FISHERIES, EQUIPMENT, *FISHING GEAR CLEANUP
 0242 " PERFORMANCE TESTING, EQUIPMENT, EPA, DESIGN-ENGINEERING, *ORNSSETT TEST FACILITY
 0248 " DISPERSANTS, SPILL RESPONSE
 0421 " SOCIOECONOMIC EFFECTS, CONTINGENCY PLANNING
 0458 " PIPELINES, ONSHORE, SPILL DISPOSAL, *OSCU
 0508 " OIL SLICKS, IXTOC 1 BLOWOUT, ENVIRONMENTAL EFFECTS, COASTAL WATERS, BEHAVIOR, TEXAS
 0513 " SHIPS, OIL SPILLS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, BEHAVIOR, STATISTICS,
 TANKERS, SPILL CONTAINMENT, *GENERAL REVIEW
 0515 " PHYSICAL ASPECTS, OXIDATION, MICROORGANISMS, LAND FARMING, CHEMICAL EFFECTS,
 BIODEGRADATION, *STIMULATION
 0638 " SAFETY, PRODUCTION, PLATFORMS, OIL INDUSTRY, OFFSHORE, DEVELOPMENT, BLOWOUTS,
 SPILL RESPONSE
 0662 " TANKERS, *CHRISTOS BITAS SPILL
 0672 " MARINE ORGANISMS, FRANCE, ENVIRONMENTAL EFFECTS, COASTS, AMOCO CADIZ SPILL,
 TOXICITY
 0711 " RECLAMATION, POLLUTION CONTROL, LAND FARMING, BURNING, WASTE OIL TREATMENT
 0725 " SOLID WASTES, INCINERATION, WASTEWATERS, *DETOXIFICATION
 0131 SPILL CONTAINMENT, PATENT, EQUIPMENT, DESIGN-ENGINEERING, BOOMS
 0132 " RIVERS, PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING, *AIR BUBBLE DIVERTE
 0133 " PERFORMANCE TESTING, DESIGN-ENGINEERING, BOOMS, *AIR JET BOOM
 0134 " PERFORMANCE TESTING, DESIGN-ENGINEERING, BOOMS, UK
 0135 " PHYSICAL ASPECTS, OIL SLICKS, BOOMS
 0136 " PERFORMANCE TESTING, ONSHORE, OIL SPILLS, CANADA, *AIR SPARGING SYSTEMS,
 *FEASIBILITY STUDY
 0137 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, BOOMS, SPILL REMOVAL
 0168 " SPILL CLEANUP, SKINNERS, PERFORMANCE TESTING, EQUIPMENT, DESIGN-ENGINEERING,
 BOOMS, UK
 0181 " PATENT, EQUIPMENT, DESIGN-ENGINEERING, SPILL REMOVAL
 0195 " ICE, CONTINGENCY PLANNING, BLOWOUTS, BEAUFORT SEA, ARCTIC, SPILL RESPONSE
 0209 " SPILL CLEANUP, SKINNERS, EQUIPMENT, BOOMS, *DEPLOYMENT METHODS
 0229 " SPILL CLEANUP, POLLUTION PREVENTION, GOVERNMENT AGENCIES, DISPERSANTS, UK
 0513 " SPILL CLEANUP, SHIPS, OIL SPILLS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, BEHAVIOR,
 STATISTICS, TANKERS, *GENERAL REVIEW
 0689 " OIL TANKS, STORAGE, *NOMOGRAPH
 0180 SPILL COOPERATIVES, SPILL CLEANUP, REGULATIONS, PERSONNEL TRAINING, DISPERSANTS
 0239 " POLLUTION CONTROL, OIL INDUSTRY, OIL DISCHARGES, BIRDS, BALLAST, SPILL RESPONSE,
 TANKERS
 0152 SPILL DISPOSAL, SPILL CLEANUP, MODELS, GUIDELINES, BIBLIOGRAPHIES
 0169 " SOLID WASTES, INCINERATION
 0186 " INCINERATION, EQUIPMENT, DESIGN-ENGINEERING, BEACH CLEANUP, TAR
 0458 " SPILL CLEANUP, PIPELINES, ONSHORE, *OSCU
 0137 SPILL REMOVAL, SPILL CONTAINMENT, PATENT, EQUIPMENT, DESIGN-ENGINEERING, BOOMS
 0141 " SPILL CLEANUP, SORBENTS, PERFORMANCE TESTING, EQUIPMENT, UK, *POLYPROPYLENE FOF
 0150 " DISPERSANTS, CANADA, BEAUFORT SEA, ARCTIC
 0155 " GUIDELINES, DISPERSANTS
 0156 " SPILL CLEANUP, PERFORMANCE TESTING, DISPERSANTS, *FEASIBILITY STUDIES, *AERIAL
 APPLICATION,
 0160 " SORBENTS, OIL SLICKS, EQUIPMENT, *FOAM STRIPS
 0161 " PRODUCT INFORMATION, PERFORMANCE TESTING, OIL SLICKS
 0163 " SORBENTS, PATENT, ABSORPTION, *PERLITE
 0166 " PRODUCT INFORMATION, OIL-WATER SEPARATION, EQUIPMENT
 0167 " PRODUCT INFORMATION, OIL-WATER SEPARATION, DESIGN-ENGINEERING
 0172 " PATENT, MICROORGANISMS, DISPERSANTS, BIODEGRADATION
 0173 " PATENT, OIL SLICKS, EQUIPMENT
 0176 " POLLUTION CONTROL, DISPERSANTS, TOXICITY, SURFACTANTS, TANKERS
 0181 " SPILL CONTAINMENT, PATENT, EQUIPMENT, DESIGN-ENGINEERING
 0184 " PERFORMANCE TESTING, ICE, BURNING, ARCTIC, *COMBUSTION PROMOTERS
 0234 " PERFORMANCE TESTING, EQUIPMENT, COLD CLIMATES, CANADA, BURNING, *INCENDIARY DEVICES
 0677 " PIPELINES, OIL SPILLS, OIL INDUSTRY, EUROPE, STATISTICS
 0002 SPILL RESPONSE, PERFORMANCE TESTING, EQUIPMENT, TRANS-ALASKA PIPELINE
 0138 " SPILL CLEANUP, OIL SLICKS, EQUIPMENT, *IHC SLICKTRAIL
 0153 " SPILL CLEANUP, MANUALS, GUIDELINES, DISPERSANTS
 0159 " SPILL CLEANUP, PERSONNEL TRAINING, MANUALS, GUIDELINES, CONTINGENCY PLANNING
 0162 " SPILL CLEANUP, MANUALS, GUIDELINES, DISPERSANTS
 0171 " SPILL CLEANUP, EQUIPMENT, DISPERSANTS, CONTINGENCY PLANNING, AMOCO CADIZ SPILL
 0192 " PERSONNEL TRAINING, OIL SPILLS, CONTINGENCY PLANNING, COASTS, CANADA, BEHAVIOR,
 *WORKSHOPS
 0193 " GOVERNMENT AGENCIES, CONTINGENCY PLANNING, UK

0195 SPILL RESPONSE, SPILL CONTAINMENT, ICE, CONTINGENCY PLANNING, BLOWOUTS, BEAUFORT SEA, ARCTIC

0196 " OFFSHORE, DRILLING, CONTINGENCY PLANNING, CANADA, BLOWOUTS, ARCTIC

0197 " SPILL CLEANUP, SHORELINES, MANUALS, CONTINGENCY PLANNING, BEAUFORT SEA, ARCTIC

0199 " SIMULATIONS, INFORMATION SYSTEMS, EQUIPMENT, CONTINGENCY PLANNING, USCG, STATISTICAL ANALYSIS, *LOGISTICS

0200 " OIL SLICKS, INFORMATION SYSTEMS, EQUIPMENT, BEHAVIOR, USCG, STATISTICAL ANALYSIS, TANKERS

0202 " NEW YORK, NEW JERSEY, GUIDELINES, CONTINGENCY PLANNING

0203 " GOVERNMENT AGENCIES, FISHERIES, BIRDS, UK, *ELENI V SPILL

0204 " POLLUTION CONTROL, DISPERSANTS

0205 " PREDICTIONS, OIL INDUSTRY, OFFSHORE, LABRADOR SEA, GOVERNMENT AGENCIES, EXPLORATION, EQUIPMENT, CONTINGENCY PLANNING, CANADA

0206 " GOVERNMENT AGENCIES, CONTINGENCY PLANNING, WILDLIFE, *USFWS

0207 " POLLUTION CONTROL, HYDROCARBONS, FRANCE, CRUDE OIL, AMOCO CADIZ SPILL

0209 " REGULATIONS, GOVERNMENT AGENCIES, DISPERSANTS, *APPLICATION PROCEDURES

0211 " ONSHORE, OIL INDUSTRY, EQUIPMENT, CONTINGENCY PLANNING, CANADA, *PRAIRIES

0212 " PERSONNEL TRAINING, GOVERNMENT AGENCIES, CONTINGENCY PLANNING, BIOLOGICAL EFFECTS, WILDLIFE, *USFWS, *WORKSHOP

0213 " SPILL CLEANUP, EQUIPMENT, CONTINGENCY PLANNING

0215 " FRANCE, CONTINGENCY PLANNING, AMOCO CADIZ SPILL, *COMMISSION REPORT

0218 " FRANCE, CONTINGENCY PLANNING

0219 " SPILL CLEANUP, ICE, CANADA, BEAUFORT SEA, ATLANTIC COAST, ARCTIC, *WORKSHOP OPINION SURVEY

0220 " PLATFORMS, IXTOC 1 BLOWOUT, BLOWOUTS

0221 " PERSONNEL TRAINING, GOVERNMENT AGENCIES, CONTINGENCY PLANNING, *USFWS

0222 " POLLUTION CONTROL, GOVERNMENT AGENCIES, CONTINGENCY PLANNING, CALIFORNIA, BIRDS

0224 " LABRADOR SEA, COASTS, CANADA, *LOGISTICS, *SUPPORT SERVICES

0230 " MONITORING, BLOWOUTS

0235 " SOURCES, OFFSHORE, CONTINGENCY PLANNING, STATISTICS, TANKERS, *USFWS

0239 " SPILL COOPERATIVES, POLLUTION CONTROL, OIL INDUSTRY, OIL DISCHARGES, BIRDS, BALLAST, TANKERS

0240 " POLLUTION CONTROL, MEDITERRANEAN SEA, UN

0248 " SPILL CLEANUP, DISPERSANTS

0422 " GOVERNMENT AGENCIES, *NEWS MEDIA, *INFORMATION DISSEMINATION

0423 " SOCIOECONOMIC EFFECTS, CONTINGENCY PLANNING, USCG, ST. LAWRENCE RIVER, *NEPCO 140 SPILL

0443 " PREDICTIONS, OCS, MOVEMENT, LABRADOR SEA, ENVIRONMENTAL EFFECTS, DRILLING, CANADA, BASELINE STUDIES, *TRAJECTORIES, *NEWFOUNDLAND

0497 " FRANCE, CONTINGENCY PLANNING, AMOCO CADIZ SPILL, *ISTPM

0519 " POLLUTION CONTROL, MICROORGANISMS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, *CONTAINED SPILLS

0559 " SIMULATIONS, LABRADOR SEA, CONTINGENCY PLANNING, CANADA, BLOWOUTS, BASELINE STUDIES

0638 " SPILL CLEANUP, SAFETY, PRODUCTION, PLATFORMS, OIL INDUSTRY, OFFSHORE, DEVELOPMENT, BLOWOUTS

0655 " OIL-GAS LEASING, ENVIRONMENTAL EFFECTS, COLD CLIMATES, ALASKA, *US GOVERNMENT

0656 " REFINERIES, DOE, BAYS, USCG, VIRGINIA

0661 " POLLUTION CONTROL, OIL SLICKS, CARIBBEAN SEA, TANKERS

0663 " OIL SPILLS, GOVERNMENT AGENCIES, TANKERS, UK, *ELENI V SPILL

0673 " OIL INDUSTRY, DISPERSANTS, CARIBBEAN SEA, TANKERS, *AEGEAN CAPTAIN SPILL, *ATLANTIC EMPRESS SPILL

0555 SPILL TRAJECTORIES, PREDICTIONS, MOVEMENT, MODELS, CONCENTRATIONS, WEATHERING, SPREADING

0560 " PREDICTIONS, OIL SLICKS, HARBORS, *HAWAII

0564 " PREDICTIONS, MOVEMENT

0569 " SIMULATIONS, BEHAVIOR

0434 SPREADING, PHYSICAL EFFECTS, MOVEMENT, ICE, FATE, COLD CLIMATES, BEHAVIOR, BASELINE STUDIES, ALASKA

0549 " SEA SURFACE, OIL SLICKS, DRIFT, BEHAVIOR

0555 " SPILL TRAJECTORIES, PREDICTIONS, MOVEMENT, MODELS, CONCENTRATIONS, WEATHERING

0423 ST. LAWRENCE RIVER, SPILL RESPONSE, SOCIOECONOMIC EFFECTS, CONTINGENCY PLANNING, USCG, *NEPCO 140 SPILL

0453 STATE GOVERNMENTS, GOVERNMENT AGENCIES, COMPENSATION, *SPILL DAMAGES

0037 STATISTICAL ANALYSIS, SOURCE IDENTIFICATION, REMOTE SENSING, OIL SPILLS

0079 " SEAWATER, GASOLINE, FRESHWATER, ECOSYSTEMS, CRUDE OIL, CONTAMINATION, BIODEGRADATION, BACTERIA, ARCTIC

0199 " SPILL RESPONSE, SIMULATIONS, INFORMATION SYSTEMS, EQUIPMENT, CONTINGENCY PLANNING, USCG, *LOGISTICS

0200 " SPILL RESPONSE, OIL SLICKS, INFORMATION SYSTEMS, EQUIPMENT, BEHAVIOR, USCG, TANKERS

0296 " SEAWATER, JAPAN, CONTAMINATION, BIODEGRADATION, BACTERIA

0324 " METABOLISM, FISH, BIOLOGICAL EFFECTS, ACUTE EFFECTS

0351 " PRODUCT INFORMATION, MICROORGANISMS, DISPERSANTS, BIOLOGICAL EFFECTS, BACTERIA

0358 " SEDIMENTS, SEAWATER, JAPAN, HYDROCARBONS, BIODEGRADATION, BACTERIA

0664 " OIL TRANSPORT, TANKERS, *COLLISIONS, *GROUNDINGS

0114 STATISTICS, SOURCE IDENTIFICATION, OIL INDUSTRY, OFFSHORE, NATURAL SEEPAGE, TANKERS, ISLAND

0225 " RISK ANALYSIS, OIL SPILLS, INFORMATION SYSTEMS, USCG, *FIRE

0235 " SPILL RESPONSE, SOURCES, OFFSHORE, CONTINGENCY PLANNING, TANKERS, *USPS

0475 " SHORTLINES, FRANCE, ENVIRONMENTAL EFFECTS, COASTS, AMOCO CADIZ SPILL

0513 " SPILL CONTAINMENT, SPILL CLEANUP, SHIPS, OIL SPILLS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, BEHAVIOR, TANKERS, *GENERAL REVIEW

0631 " PRODUCTION, PLATFORMS, OFFSHORE, OCS, BLOWOUTS

0677 " SPILL REMOVAL, PIPELINES, OIL SPILLS, OIL INDUSTRY, EUROPE

0696 " OIL SPILLS, INFORMATION SYSTEMS, COASTAL WATERS, USCG, US, *1977-1978 DATA

0214 STORAGE, OIL TRANSFER, OIL TANKS, OIL REMOVAL, CONTINGENCY PLANNING, AMOCO CADIZ SPILL, TANKERS

0520 " SOIL, SLUDGE, PETROLEUMS, LAND FARMING, DISPOSAL, BIODEGRADATION

0646 " PIPELINES, FOSSIL FUELS, ENVIRONMENTAL EFFECTS, DRILLING

0687 " PORTS, OIL-WATER SEPARATION, OIL TANKS, ENVIRONMENTAL EFFECTS, BALLAST, ALASKA

0688 " POLLUTION PREVENTION, CRUDE OIL, SWEDEN, *UNDERGROUND CAVERNS

0689 " SPILL CONTAINMENT, OIL TANKS, *MONOGRAPH

0573 SUBARCTIC REGIONS, PHYSICAL EFFECTS, MARINE ENVIRONMENT, FATE, ENVIRONMENTAL EFFECTS, COLD CLIMATES

0258 SUBLETHAL EFFECTS, CHRONIC EFFECTS, BIRDS, ANALYTICAL TECHNIQUES

0263 " MORTALITY, AROMATIC HYDROCARBONS, *TOLUENE, *RESPIRATION, *MARINE ISPODS

0272 " FUEL OIL, BEHAVIOR, AROMATIC HYDROCARBONS, TOXICITY, WSP, *BARNACLE LARVAE

0281 " CRUSTACEANS, CRUDE OIL, *BROWN SHRIMP, *ENZYMES

0305 " PRODUCTION, BIOLOGICAL EFFECTS, AMOCO CADIZ SPILL, ZOOPLANKTON, *WYSON, *RESPIRATION

0312 " MORTALITY, MARINE ORGANISMS, FRANCE, DISTRIBUTION, COASTAL WATERS, *WYSON, AMOCO CADIZ SPILL

0327 " PETROLEUM PRODUCTS, METABOLISM, MARINE ORGANISMS, HYDROCARBONS, BOOK REVIEW, TOXICITY

0349 " PLANTS, ALASKA, *SEAGRASS PHOTOSYNTHESIS

0365 " HYDROCARBONS, BIRDS, *MALLARD DUCKS, *HEPATIC FUNCTION

0389 " MOLLUSKS, DISPERSION, CRUDE OIL, UPTAKE, *MACOMA BALTHICA

0398 " PETROLEUMS, MARINE ORGANISMS, HYDROCARBONS, FATE, ACUTE EFFECTS, ESTUARIES, WASTEWATERS

0442 " OCS, HYDROCARBONS, BASELINE STUDIES, ALASKA, *TRACE METALS, *BIOTRANSFORMATIONS

0176 SURFACTANTS, SPILL REMOVAL, POLLUTION CONTROL, DISPERSANTS, TOXICITY, TANKERS

0040 SURVEILLANCE, REMOTE SENSING, MONITORING, *KURDISTAN SPILL

0046 " REMOTE SENSING, EQUIPMENT, DESIGN-ENGINEERING, USCG, *AOSS II

0050 " REMOTE SENSING, MONITORING, CONTAMINATION

0642 " RECOVERY, OIL WELLS, ENVIRONMENTAL EFFECTS, DRILLING

0143 SWEDEN, SPILL CLEANUP, SORBENTS, PERFORMANCE TESTING, *BREGOIL

0698 " STORAGE, POLLUTION PREVENTION, CRUDE OIL, *UNDERGROUND CAVERNS

0060 TANKERS, SAMPLING, MEDITERRANEAN SEA, HYDROCARBONS, CONCENTRATIONS

0114 " STATISTICS, SOURCE IDENTIFICATION, OIL INDUSTRY, OFFSHORE, NATURAL SEEPAGE, ISLAND

0119 " SOURCE IDENTIFICATION, SAMPLING, OIL SPILLS, OIL DISCHARGES, CHROMATOGRAPHY, CHEMICAL ANALYSIS, TAR

0176 " SURFACTANTS, SPILL REMOVAL, POLLUTION CONTROL, DISPERSANTS, TOXICITY

0198 " SPILL CLEANUP, SKINNERS, POLLUTION CONTROL, DISPERSION, *OIL SPREADING

0200 " STATISTICAL ANALYSIS, SPILL RESPONSE, OIL SLICKS, INFORMATION SYSTEMS, EQUIPMENT, BEHAVIOR, USCG

0214 " STORAGE, OIL TRANSFER, OIL TANKS, OIL REMOVAL, CONTINGENCY PLANNING, AMOCO CADIZ SPILL

0235 " STATISTICS, SPILL RESPONSE, SOURCES, OFFSHORE, CONTINGENCY PLANNING, *USPS

0239 " SPILL RESPONSE, SPILL COOPERATIVES, POLLUTION CONTROL, OIL INDUSTRY, OIL DISCHARGES, BIRDS, BALLAST

0513 " STATISTICS, SPILL CONTAINMENT, SPILL CLEANUP, SHIPS, OIL SPILLS, ENVIRONMENTAL EFFECTS, BIODEGRADATION, BEHAVIOR, *GENERAL REVIEW

0661 " SPILL RESPONSE, POLLUTION CONTROL, OIL SLICKS, CARIBBEAN SEA

0662 " SPILL CLEANUP, *CHRISTOS PITAS SPILL

0663 " SPILL RESPONSE, OIL SPILLS, GOVERNMENT AGENCIES, UK, *ELEPH V SPILL

0664 " STATISTICAL ANALYSIS, OIL TRANSPORT, *COLLISIONS, *GROUNDINGS

0665 " SHIPS, POLLUTION CONTROL, PERSONNEL TRAINING, OIL TRANSPORT, OIL DISCHARGES, INTERNATIONAL AGREEMENTS, EQUIPMENT

0666 " MARINE ENVIRONMENT, *OLYMPIC BRAVERY SPILL

0667 " OIL SPILLS, *ACCIDENTS

0668 " OIL SPILLS, OIL DISCHARGES, INTERNATIONAL AGREEMENTS, INCO, *PROCEEDINGS

0669 " SHIPS, HARBORS, TEXAS, *M/V AMCO SCEPTRE COLLISION

0670 " SEGREGATED BALLAST, SAFETY, POLLUTION PREVENTION, OIL DISCHARGES, DESIGN-ENGINEERING

0671 " OIL SPILLS, ARGO MERCHANT SPILL

0673 " SPILL RESPONSE, OIL INDUSTRY, DISPERSANTS, CARIBBEAN SEA, *ARGO MERCHANT SPILL, *ATLANTIC EXPRESS SPILL

0681 " REGULATIONS, POLLUTION PREVENTION, OIL TRANSPORT, OIL TERMINALS, BALLAST, UK, *SYLLOM VOE

0685 TANKERS, SEGREGATED BALLAST, PORTS, POLLUTION CONTROL, OIL DISCHARGES, BALLAST,
*LOAD ON TOP METHOD

0690 " SAFETY, REGULATIONS, POLLUTION PREVENTION, PERSONNEL TRAINING, OIL TRANSPORT,
GUIDELINES, USCG

0691 " SOURCES, SHIPS, OIL SPILLS, OFFSHORE, INFORMATION SYSTEMS, FRANCE, DRILLING, *DATA
BANK, *ACCIDENTS

0693 " FRANCE, AMOCO CADIZ SPILL, *GROUNDINGS, *PHOTOGRAPHY

0695 " SHIPS, SANTA BARBARA CHANNEL, PRODUCTION, PORTS, PACIFIC COAST, OIL TRANSPORT,
OCS, DEVELOPMENT

0697 " PORTS, PACIFIC OCEAN, OIL TRANSPORT, OIL TRANSFER, ENVIRONMENTAL EFFECTS,
ECONOMICS, *MALACCA STRAITS, *PALAU

0065 TAR, SAMPLING, MONITORING, DISTRIBUTION, CONCENTRATIONS, AFRICA

0119 " TANKERS, SOURCE IDENTIFICATION, SAMPLING, OIL SPILLS, OIL DISCHARGES,
CHROMATOGRAPHY, CHEMICAL ANALYSIS

0186 " SPILL DISPOSAL, INCINERATION, EQUIPMENT, DESIGN-ENGINEERING, BEACH CLEANUP

0405 " INDIA, COASTS, BEACHES, *RESIDUAL OILS

0571 " SAMPLING, NATURAL SEEPAGE, HYDROCARBONS, GULF OF MEXICO, CHEMICAL ANALYSIS

0595 " SANTA BARBARA CHANNEL, ONSHORE, OFFSHORE, NATURAL SEEPAGE, CALIFORNIA, *ASPHALT
DEPOSITS

0600 " PETROLEUM PRODUCTS, OIL SHALE, HEALTH HAZARDS, CRUDE OIL, CARCINOGENS, USSR,
*BENZO(A)PYRENE, *ESTONIA

0601 " OIL SHALE, HEALTH HAZARDS, EXTRACTION, CARCINOGENS, WASTEWATERS, USSR, *PHENOLS,
*ESTONIA

0526 TAR SANDS, SEAWATER, PHYSICAL EFFECTS, HYDROCARBONS, EQUIPMENT, CRUDE OIL,
BIODEGRADATION, BACTERIA, *TEMPERATURE

0260 TEXAS, OCS, GROWTH, CRUDE OIL, CHRONIC EFFECTS, BENTHOS, BACTERIA, ACUTE EFFECTS

0464 " SEDIMENTS, OIL FIELDS, MARINE ORGANISMS, HYDROCARBONS, CONCENTRATIONS, BENTHOS,
WASTEWATERS, *BRINES

0468 " PRODUCTION, PLATFORMS, OFFSHORE, OCS, HABITATS, ENVIRONMENTAL EFFECTS, ECOSYSTEMS,
*BUCCANER OIL FIELD

0508 " SPILL CLEANUP, OIL SLICKS, ITOC 1 BLOWOUT, ENVIRONMENTAL EFFECTS, COASTAL WATERS,
BEHAVIOR

0660 " OIL SPILLS, COASTAL WATERS, BURNING, BEACHES, *BURMAN AGATE SPILL

0669 " TANKERS, SHIPS, HARBORS, *M/V AMCO SCUTTER COLLISION

0686 " SHIPS, PORTS, HARBORS, GULF OF MEXICO, ENVIRONMENTAL EFFECTS, *ENVIRONMENTAL
MANAGEMENT

0157 TOXICITY, PERFORMANCE TESTING, INTERTIDAL ZONE, DISPERSANTS, BIOLOGICAL EFFECTS,
BIOASSAY, BEACH CLEANUP

0176 " TANKERS, SURFACTANTS, SPILL REMOVAL, POLLUTION CONTROL, DISPERSANTS

0255 " CRUSTACEANS, CRUDE OIL, BIOLOGICAL EFFECTS, *LOBSTERS

0259 " DISPERSANTS, CRUDE OIL, BIRDS, BIOLOGICAL EFFECTS, WILDLIFE, *CORPUS 9527,
*MALLARD DUCKS

0261 " PHYTOPLANKTON, CRUDE OIL, BERING SEA

0264 " NORWAY, MORTALITY, FUEL OIL, BIRDS, *BRUNNICH'S GUILLEMOTS

0267 " MICROORGANISMS, FUEL OIL, CRUDE OIL, BIOLOGICAL EFFECTS, AROMATIC HYDROCARBONS,
ALGAE, *DIATOMS

0272 " SUBLETHAL EFFECTS, FUEL OIL, BEHAVIOR, AROMATIC HYDROCARBONS, WSP, *BARNACLE LARVAE

0273 " METABOLISM, FUEL OIL, FRESHWATER, CRUDE OIL, BENTHOS, BACTERIA, ALGAE, WASTE OIL,
*COMMUNITIES

0276 " PETROCHEMICALS, HYDROCARBONS, FISH, ACUTE EFFECTS, *GOLDFISH

0278 " OXIDATION, MUTAGENS, FUEL OIL, YEASTS, *PHOTOPRODUCTS

0284 " GROWTH, FISH, DISPERSANTS, CRUSTACEANS, *MILKFISH, *GRASS SHRIMP

0288 " MORTALITY, HYDROCARBONS, CHRONIC EFFECTS, BIRDS, ANALYTICAL TECHNIQUES, ACUTE
EFFECTS, WILDLIFE

0289 " METABOLISM, CRUDE OIL, CONCENTRATIONS, BIOLOGICAL EFFECTS, ALGAE

0290 " MORTALITY, CRUSTACEANS, BIOLOGICAL EFFECTS, WSP

0297 " METABOLISM, MARINE ORGANISMS, BIODEGRADATION, AROMATIC HYDROCARBONS, UPTAKE

0301 " GROWTH, CRUDE OIL, BIRDS

0303 " BIRDS, BIOLOGICAL EFFECTS, *JAPANESE QUAIL, *CANADA GOOSE, *EGG HATCHABILITY

0304 " REFINERIES, FUEL OIL, CRUSTACEANS, WASTEWATERS, *GRASS SHRIMP

0307 " PETROLEUM PRODUCTS, MICROORGANISMS, CRUDE OIL, BACTERIA, UPTAKE

0308 " GROWTH, BIRDS, AROMATIC HYDROCARBONS, *MALLARD DUCKS

0309 " GROWTH, DEVELOPMENT, CRUDE OIL, BIRDS, *MALLARD DUCKS, *NICKEL, *VANADIUM

0317 " PHYTOPLANKTON, METABOLISM, CRUDE OIL, BIRDS, *MALLARD DUCKS, *NICKEL, *VANADIUM

0320 " MICROORGANISMS, HYDROCARBONS, UPTAKE, *N-ALKANES, *DIATOMS

0322 " MOLLUSKS, GROWTH, FILTRATION, CRUDE OIL, CONTAMINATION, CASPIAN SEA, USSR

0326 " MORTALITY, MARSHES, CONTAMINATION, BIRDS, *RESUSPENSION

0327 " SUBLETHAL EFFECTS, PETROLEUM PRODUCTS, METABOLISM, MARINE ORGANISMS, HYDROCARBONS,
BOOK REVIEW

0334 " PAH, MORTALITY, DEVELOPMENT, CRUSTACEANS, *MUD CRABS, *NAPHTHALEN, *PHENANTHRENE,
*SALINITY AND TEMPERATURE EFFECTS

0335 " FUEL OIL, CRUSTACEANS, CONCENTRATIONS, CHRONIC EFFECTS, WSP, *MUD CRABS

0337 " MARINE ORGANISMS, FUEL OIL, AROMATIC HYDROCARBONS, *AMPHIPODS, *PLASMODIUM PECTENICRUS

0339 " MARINE ORGANISMS, CRUDE OIL, AMOCO CADIZ SPILL

0341 TOXICITY, METABOLISM, FISH, AROMATIC HYDROCARBONS, UPTAKE, *FUNDULUS HETEROCLOTUS,
 *NAPHTHALENE, *SALINITY
 0345 " SORBENTS, PRODUCT INFORMATION, PERFORMANCE TESTING, MARINE ORGANISMS, ABSORPTION
 0361 " MORTALITY, MOLLUSKS, FUEL OIL, ESTUARIES, DELAWARE, CRUDE OIL, CHRONIC EFFECTS,
 *CRASSOSTREA VIRGINICA
 0375 " MORTALITY, BIRDS, UK
 0380 " CHRONIC EFFECTS, BIOASSAY, VERTEBRATES, *AMPHIBIANS
 0398 " REPRODUCTION, CONCENTRATIONS, ALGAE
 0390 " HYDROCARBONS, GROWTH, DEVELOPMENT, DEPURATION, BIRDS, ANALYTICAL TECHNIQUES,
 UPTAKE, *RESEARCH REVIEW
 0391 " PETROLEUM PRODUCTS, PACIFIC COAST, MORTALITY, MOLLUSKS, GULF OF ALASKA, CALIFORNIA
 0392 " FUEL OIL, CRUSTACEANS, BEHAVIOR, *LIMULUS POLYPHEMUS, *MOLTING
 0394 " PHYTOPLANKTON, PETROLEUM PRODUCTS, GROWTH, DISPERSANTS, *DIATOMS, *EUGLENIPIPS
 0396 " PETROLEUM PRODUCTS, MUTAGENS, CRUDE OIL, ALGAE, *CHLAMYDOMONAS REINHARDTII
 0400 " REPRODUCTION, FUEL OIL, BIRDS, *JAPANESE QUAIL
 0403 " PHYSICAL ASPECTS, HYDROCARBONS, DISTRIBUTION, DISPERSION
 0418 " SEDIMENTS, SEDIMENTATION, BEHAVIOR, AMOCO CADIZ SPILL, WEATHERING
 0419 " SHORTLINES, CONTAMINATION, AMOCO CADIZ SPILL, WEATHERING
 0447 " METABOLISM, HYDROCARBONS, DEPURATION, CHRONIC EFFECTS, BASELINE STUDIES, ALASKA,
 ACUTE EFFECTS, UPTAKE, ORGANISMS
 0469 " PAH, ENVIRONMENTAL EFFECTS, CARCINOGENS
 0491 " SEDIMENTS, SEAWATER, MONITORING, MICROORGANISMS, FISH, FATE, BIRDS,
 BIODEGRADATION, BEHAVIOR, AMOCO CADIZ SPILL
 0506 " SOURCES, MARINE ORGANISMS, MARINE ENVIRONMENT, HYDROCARBONS, GULF OF MEXICO,
 CONCENTRATIONS, CHEMICAL ANALYSIS, *VOLATILE LIQUID FRACTIONS
 0572 " PAH, HYDROCARBONS, FATE, CONCENTRATIONS, AQUATIC ENVIRONMENT, ANALYTICAL
 TECHNIQUES
 0576 " SEDIMENTS, MODELS, HYDROCARBONS, FATE, CONTAMINATION, ARGO MERCHANT SPILL
 0598 " OIL SHALE, FISH, EXTRACTION, WASTEWATERS, *RAINBOW TROUT, *PATHEAD MINNOWS
 0606 " PRODUCTION, OIL SHALE, METABOLISM, EXTRACTION, WASTEWATERS, MAMMALS, *RATS
 0610 " OIL SHALE, EXTRACTION, CHEMICAL EFFECTS, CHEMICAL ANALYSIS, WASTEWATERS, WATER
 QUALITY
 0612 " OFFSHORE, MARINE ORGANISMS, ESTUARIES, DRILLING, BIOLOGICAL EFFECTS, BENTHOS,
 *BIOCIDES
 0613 " PETROLEUM PRODUCTS, OIL SHALE, HEALTH HAZARDS, CHRONIC EFFECTS, ANIMALS, USSR,
 *PHENOLS, *ESTONIA
 0614 " OFFSHORE, EXPLOATION, DRILLING, CHEMICAL EFFECTS, CHEMICAL ANALYSIS, CANADA,
 ARCTIC, WASTEWATER DISPOSAL, *DRILLING MUDS
 0672 " SPILL CLEANUP, MARINE ORGANISMS, FRANCE, ENVIRONMENTAL EFFECTS, COASTS, AMOCO
 CADIZ SPILL
 0698 " REFINERIES, MARINE ENVIRONMENT, EUROPE, DISPOSAL, WASTEWATER TREATMENT
 0699 " SOIL, PLANTS, LAND FARMING, EMULSIONS, DISPOSAL, WASTE OIL
 0737 " REFINERIES, BIOLOGICAL EFFECTS, WASTEWATERS, *TOXICITY TESTING
 0002 TRANS-ALASKA PIPELINE, SPILL RESPONSE, PERFORMANCE TESTING, EQUIPMENT
 0674 " RIVERS, PIPELINES, OIL SPILLS, LEAKAGE
 0679 " REGULATIONS, PIPELINES, GOVERNMENT AGENCIES, FISH, WILDLIFE
 0008 UK, MONITORING, MARINE ENVIRONMENT
 0035 " REMOTE SENSING, OIL SLICKS, *THERMAL IR MEASUREMENTS
 0126 " SOURCE IDENTIFICATION, OIL DISCHARGES, INDUSTRIES, HYDROCARBONS, ESTUARIES,
 *VOLATILE FRACTIONS
 0134 " SPILL CONTAINMENT, PERFORMANCE TESTING, DESIGN-ENGINEERING, BOOMS
 0141 " SPILL REMOVAL, SPILL CLEANUP, SORBENTS, PERFORMANCE TESTING, EQUIPMENT,
 *POLYPROPYLENE MOP
 0168 " SPILL CONTAINMENT, SPILL CLEANUP, SKIMMERS, PERFORMANCE TESTING, EQUIPMENT,
 DESIGN-ENGINEERING, BOOMS
 0193 " SPILL RESPONSE, GOVERNMENT AGENCIES, CONTINGENCY PLANNING
 0203 " SPILL RESPONSE, GOVERNMENT AGENCIES, FISHERIES, BIRDS, *ELENI V SPILL
 0229 " SPILL CONTAINMENT, SPILL CLEANUP, POLLUTION PREVENTION, GOVERNMENT AGENCIES,
 DISPERSANTS
 0279 " OIL SLICKS, MORTALITY, HARBORS, COASTAL WATERS, BIRDS
 0352 " MORTALITY, BIRDS, AMOCO CADIZ SPILL, *AUKS
 0375 " TOXICITY, MORTALITY, BIRDS
 0466 " OIL DISCHARGES, MONITORING, MARINE ENVIRONMENT, INDUSTRIES, ENVIRONMENTAL EFFECTS,
 BIOINDICATORS
 0472 " OIL SPILLS, MARINE ENVIRONMENT, *ANNUAL REPORT - 1976
 0473 " OIL SPILLS, MARINE ENVIRONMENT, *ANNUAL REPORT - 1977
 0477 " FISHERIES, ESTUARIES, BIOLOGICAL EFFECTS
 0487 " MONITORING, GROUNDWATER, EXPLOATION, DEVELOPMENT, DETECTION, CONTAMINATION,
 *CONFERENCE
 0495 " RIVERS, GROUNDWATER, GASOLINE, *AIRPORTS
 0663 " TANKERS, SPILL RESPONSE, OIL SPILLS, GOVERNMENT AGENCIES, *ELENI V SPILL
 0681 " TANKERS, REGULATIONS, POLLUTION PREVENTION, OIL TRANSFER, OIL TREATMENTS, BALLAST,
 *SULLOY VOR
 0736 " REUSE, REGULATIONS, RECYCLING, LEGISLATION, ITALY, GERMANY, FRANCE, DENMARK, WASTE
 OIL, US

0016 UN, MONITORING, MARINE ENVIRONMENT, *IOC/WMO WORKSHOP
 0236 " POLLUTION PREVENTION, POLLUTION CONTROL, MARINE ENVIRONMENT
 0240 " SPILL RESPONSE, POLLUTION CONTROL, MEDITERRANEAN SEA
 0451 " POLLUTION PREVENTION, KUWAIT, INTERNATIONAL CONVENTIONS, *MIDDLE EAST
 0457 " SOURCES, RIVERS, POLLUTION CONTROL, ONSHORE, OFFSHORE, LIABILITY, DEVELOPMENT, COMPENSATION, *UNECE CONVENTION
 0640 " SHIPS, OFFSHORE, MARINE ENVIRONMENT, ENVIRONMENTAL EFFECTS, DEVELOPMENT, COASTAL WATERS, *PROCEEDINGS
 0027 UPTAKE, HYDROCARBONS, DETECTION, CRUSTACEANS, *NAPHTHALENE, *CALLINECTES SAPIDUS
 0088 " PETROLEUM PRODUCTS, PAH, OREGON, MOLLUSKS, CONCENTRATIONS, CARCINOGENS, *MUSSELS
 0091 " GC/MS, FISH, CRUDE OIL, CONTAMINATION, CHEMICAL ANALYSIS, *ORGANIC SULFUR COMPOUNDS
 0254 " METABOLISM, HYDROCARBONS, FISH, *TOLUENE, *BENZENE
 0262 " MOLLUSKS, HYDROCARBONS, BIOASSAY, *CHRONIC POLLUTION, *MUSSELS
 0270 " INVERTEBRATES, HYDROCARBONS, FOOD WEB, FISH, *BLUEGILL SUNFISH, *MOSQUITO
 0285 " METABOLISM, DEPURATION, AROMATIC HYDROCARBONS, ANIMALS, *RATS
 0286 " METABOLISM, FISH, CHROMATOGRAPHY, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, *COHO SALMON, *NAPHTHALENE
 0291 " PAH, MOLLUSKS, FISH, CRUSTACEANS, CONTAMINATION, CARCINOGENS, *COMMERCIAL SEAFOODS, *CREOSOTE
 0297 " TOXICITY, METABOLISM, MARINE ORGANISMS, BIODEGRADATION, AROMATIC HYDROCARBONS
 0307 " TOXICITY, PETROLEUM PRODUCTS, MICROORGANISMS, CRUDE OIL, BACTERIA
 0316 " PAH, MOLLUSKS, MARINE ORGANISMS, DISTRIBUTION, DEPURATION, AQUATIC ENVIRONMENT
 0320 " TOXICITY, MICROORGANISMS, HYDROCARBONS, *N-ALKANES, *DIATOMS
 0328 " METABOLISM, FISH, DEPURATION, AROMATIC HYDROCARBONS, *PACIFIC HERRING, *BENZENE, *TOLUENE
 0336 " MOLLUSKS, METABOLISM, MARINE ORGANISMS, HYDROCARBONS, CRUSTACEANS, BIOINDICATORS, ANNELIDS, *DETOXIFICATION MECHANISMS
 0341 " TOXICITY, METABOLISM, FISH, AROMATIC HYDROCARBONS, *FUNDULUS HETEROCLITUS, *NAPHTHALENE, *SALINITY
 0346 " SEDIMENTS, SEAWATER, HYDROCARBONS, CONTAMINATION, ANNELIDS, *RELEASE, *ARENICOLA MARINA, *NAPHTHALENE
 0348 " FUEL OIL, FISH, DISPERSANTS, BIOLOGICAL EFFECTS
 0353 " PAH, FISH, DEPURATION, CHRONIC EFFECTS, ACUTE EFFECTS, *ACCUMULATION, *RAINBOW TROUT, *NAPHTHALENE
 0357 " MOLLUSKS, METABOLISM, BIOLOGICAL EFFECTS, *MYTILUS GALLPROVINCIALIS
 0362 " FISH, DEPURATION, CRUDE OIL, CONCENTRATIONS, AROMATIC HYDROCARBONS, *ORGANIC SULFUR COMPOUNDS
 0364 " METABOLISM, HYDROCARBONS, FISH, *SAITHE, *PHENANTHRENE
 0383 " METABOLISM, FISH, AROMATIC HYDROCARBONS, *RAINBOW TROUT, *PHENANTHRENE
 0384 " PAH, FISH, DEPURATION, CRUDE OIL, *COALEFISH, *PHENANTHRENE
 0399 " SUBLETHAL EFFECTS, MOLLUSKS, DISPERSION, CRUDE OIL, *MACOMA BALTHICA
 0390 " TOXICITY, HYDROCARBONS, GROWTH, DEVELOPMENT, DEPURATION, BIRDS, ANALYTICAL TECHNIQUES, *RESEARCH REVIEW
 0399 " METABOLISM, FOOD WEB, CRUDE OIL, BIOLOGICAL EFFECTS, WSP, *ATTENTION
 0426 " SEDIMENTS, OCS, MARINE ORGANISMS, HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA
 0427 " SEDIMENTS, OCS, MARINE ORGANISMS, HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA
 0429 " SEDIMENTS, OCS, MARINE ORGANISMS, HYDROCARBONS, BENTHOS, BASELINE STUDIES, ALASKA
 0447 " TOXICITY, METABOLISM, HYDROCARBONS, DEPURATION, CHRONIC EFFECTS, BASELINE STUDIES, ALASKA, ACUTE EFFECTS, ORGANISMS
 0587 " PAH, OXIDATION, METABOLISM, ESTUARIES, COASTAL WATERS, BIODEGRADATION
 0591 " METABOLISM, MARINE ORGANISMS, FATE, AROMATIC HYDROCARBONS
 0604 " PLATFORMS, HYDROCARBONS, GULF OF MEXICO, DEPURATION, CRUSTACEANS, CONCENTRATIONS, *BARNACLES, *ALKANES
 0616 " SEDIMENTS, SEDIMENTATION, PRODUCTION, OFFSHORE, METABOLISM, MARINE ORGANISMS, FOOD WEB, *HEAVY METALS
 0750 " METABOLISM, HYDROCARBONS, BACTERIA, *CREOSOTE-TREATED PILING, *ISOPODS, *LINNORIA TRIPUNCTATA
 0415 URQUIOLA SPILL, SPAIN, SEDIMENTATION, INTERTIDAL ZONE, DISTRIBUTION, CRUDE OIL, BEACHES
 0244 US, REGULATIONS, POLLUTION CONTROL, OIL INDUSTRY, LEGISLATION, INTERNATIONAL CONVENTIONS, *NAVIGATION AIDS
 0455 " REGULATIONS, OIL DISCHARGES, LIABILITY, LEGISLATION
 0456 " LIABILITY, LEGISLATION, LAW ENFORCEMENT, USCG
 0602 " OIL SHALE, OIL INDUSTRY, MORTALITY, HEALTH HAZARDS, EXTRACTION, CARCINOGENS, *SHALE OIL WORKERS
 0625 " POLLUTION CONTROL, OIL INDUSTRY, OFFSHORE, OCS, LEGISLATION, EIS
 0627 " OIL-GAS LEASING, OCS, LEGISLATION, GOVERNMENT AGENCIES
 0645 " PRODUCTION, OFFSHORE, FISHERIES, ENVIRONMENTAL EFFECTS, ECONOMICS
 0696 " STATISTICS, OIL SPILLS, INFORMATION SYSTEMS, COASTAL WATERS, USCG, *1977-1978 DATA
 0735 " REGULATIONS, RECYCLING, LEGISLATION, DISPOSAL, CALIFORNIA, WASTE OIL, *MINNESOTA, *UTAH
 0736 " UK, REUSE, REGULATIONS, RECYCLING, LEGISLATION, ITALY, GERMANY, FRANCE, DENMARK, WASTE OIL
 0745 " SAFETY, RISK ANALYSIS, PACIFIC COAST, OFFSHORE, OCS, DEVELOPMENT, ATLANTIC COAST, ALASKA, *ENVIRONMENTAL HAZARDS
 0748 " FRANCE, AMOCO CADIZ SPILL, *RESEARCH REVIEW

0046 USCG, SURVEILLANCE, REMOTE SENSING, EQUIPMENT, DESIGN-ENGINEERING, *ACST II
 0118 " SOURCE IDENTIFICATION, OIL SPILLS, ANALYTICAL TECHNIQUES, WEATHERING,
 *COMPUTERIZED PATTERN RECOGNITION
 0190 " SPILL CLEANUP, PERSONNEL TRAINING, PERFORMANCE TESTING, OIL INDUSTRY, EQUIPMENT,
 DISPERSANTS, CALIFORNIA
 0199 " STATISTICAL ANALYSIS, SPILL RESPONSE, SIMULATIONS, INFORMATION SYSTEMS, EQUIPMENT,
 CONTINGENCY PLANNING, *LOGISTICS
 0200 " TANKERS, STATISTICAL ANALYSIS, SPILL RESPONSE, OIL SLICKS, INFORMATION SYSTEMS,
 EQUIPMENT, BEHAVIOR
 0216 " LEGISLATION, GOVERNMENT AGENCIES, EPA, CONTINGENCY PLANNING, *EPA
 0225 " STATISTICS, RISK ANALYSIS, OIL SPILLS, INFORMATION SYSTEMS, *PIES
 0423 " ST. LAWRENCE RIVER, SPILL RESPONSE, SOCIOECONOMIC EFFECTS, CONTINGENCY PLANNING,
 *EPCO 140 SPILL
 0456 " US, LIABILITY, LEGISLATION, LAW ENFORCEMENT
 0656 " SPILL RESPONSE, REFINERIES, DOE, BAYS, VIRGINIA
 0690 " TANKERS, SAFETY, REGULATIONS, POLLUTION PREVENTION, PERSONNEL TRAINING, OIL
 TRANSPORT, GUIDELINES
 0696 " US, STATISTICS, OIL SPILLS, INFORMATION SYSTEMS, COASTAL WATERS, *1977-1978 DATA
 0145 US GOVERNMENT, SPILL CLEANUP, OIL INDUSTRY, LEGISLATION, ECONOMICS
 0654 " OIL-GAS LEASING, OFFSHORE, GEORGES BANK, FISHERIES, DRILLING
 0655 " SPILL RESPONSE, OIL-GAS LEASING, ENVIRONMENTAL EFFECTS, COLD CLIMATES, ALASKA
 0105 JESSE, SAMPLING, RIVERS, OIL SHALE, OIL INDUSTRY, LAKES, CONCENTRATIONS, WASTEWATERS,
 *ESTONIA
 0322 " TOXICITY, MOLLUSKS, GROWTH, FILTRATION, CRUDE OIL, CONTAMINATION, CASPIAN SEA
 0600 " TAR, PETROLEUM PRODUCTS, OIL SHALE, HEALTH HAZARDS, CRUDE OIL, CARCINOGENS,
 *BENZ(a)PYRENE, *ESTONIA
 0601 " TAR, OIL SHALE, HEALTH HAZARDS, EXTRACTION, CARCINOGENS, WASTEWATERS, *PHENOLS,
 *ESTONIA
 0608 " OIL SHALE, OIL INDUSTRY, EXTRACTION, CHRONIC EFFECTS, CARCINOGENS, *CANCER
 INCIDENCE, *ESTONIA
 0613 " TOXICITY, PETROLEUM PRODUCTS, OIL SHALE, HEALTH HAZARDS, CHRONIC EFFECTS, ANIMALS,
 *PHENOLS, *ESTONIA
 0062 VEGETATION, SEDIMENTS, SAMPLING, FRESHWATER, FISH, DISTRIBUTION, CONTAMINATION,
 CONCENTRATIONS, *TETRAALKYLLEAD COMPOUNDS
 0344 " SOIL, METABOLISM, BIOLOGICAL EFFECTS, ARCTIC, *TUNDRA, *ROOTS, *SOIL CELLULOSE
 0632 " OIL SHALE, EXTRACTION, ENVIRONMENTAL EFFECTS
 0744 " SOBBETS, MARSHES, ABSORPTION, *OILY HERBICIDE SPILLS
 0380 VERTEBRATES, TOXICITY, CHRONIC EFFECTS, BIOASSAY, *AMPHIBIANS
 0656 VIRGINIA, USCG, SPILL RESPONSE, REFINERIES, DOE, BAYS
 0551 WASHINGTON, SOURCES, SEDIMENTS, PAH, FATE, CONCENTRATIONS, CHEMICAL EFFECTS, BAYS,
 ZOOPLANKTON, *FECAL PELLETS
 0643 " PACIFIC COAST, OREGON, OIL DISCHARGES, OFFSHORE, OCS, ESTUARIES, DEVELOPMENT,
 COASTS, ALASKA
 0007 WASTE OIL, REFINERIES, MONITORING, BIOINDICATORS, WASTEWATERS
 0273 " TOXICITY, METABOLISM, FUEL OIL, FRESHWATER, CRUDE OIL, BENTHOS, BACTERIA, ALGAE,
 *COMMUNITIES
 0618 " SOCIOECONOMIC EFFECTS, REUSE, REFINERIES, OIL FIELDS, WASTEWATERS, WATER QUALITY,
 *BAVARIA, *SEER, *TOURISM
 0699 " TOXICITY, SOIL, PLANTS, LAND FARMING, EMULSIONS, DISPOSAL
 0712 " LAND FARMING, INDUSTRIES, DISPOSAL, WASTEWATERS
 0713 " SOURCE IDENTIFICATION, MONITORING, WASTEWATERS, *BARE EARTH TAGGING
 0717 " RECLAMATION, LAND FARMING, FUEL OIL, DISPOSAL, BIODEGRADATION, WASTEWATERS
 0718 " SOIL, PLANTS, LAND FARMING, DISPOSAL
 0720 " SOIL, PLANTS, MONITORING, LAND FARMING, FUEL OIL, DISPOSAL, CRUDE OIL, CRANKCASE
 OIL, BIOLOGICAL EFFECTS
 0721 " LAND FARMING, INDUSTRIES, DISPOSAL, BOOK REVIEW, WASTEWATERS
 0724 " SOIL, LAND FARMING, DISPOSAL, *LEACHING TEST
 0731 " REUSE, REFINING, RECYCLING, LAND FARMING, FUEL OIL, DISPOSAL, *COMBUSTION
 0732 " RECOVERY MANAGEMENT, REGULATIONS, REFINING, RECYCLING, INDUSTRIES, CONSERVATION
 0733 " REFINING, RECYCLING, RECLAMATION, DISPOSAL, CRANKCASE OIL
 0734 " REUSE, REFINING, RECLAMATION, LEGISLATION, GOVERNMENT AGENCIES, DISPOSAL, *BUREAU
 OF MINES
 0735 " US, REGULATIONS, RECYCLING, LEGISLATION, DISPOSAL, CALIFORNIA, *MINNESOTA, *UTAH
 0736 " US, UK, REUSE, REGULATIONS, RECYCLING, LEGISLATION, ITALY, GERMANY, FRANCE, DENMARK
 0711 WASTE OIL TREATMENT, SPILL CLEANUP, RECLAMATION, POLLUTION CONTROL, LAND FARMING,
 BURNING
 0719 " INDUSTRIES, ECONOMICS, WASTEWATER TREATMENT, *CAPABILITIES
 0007 WASTEWATERS, WASTE OIL, REFINERIES, MONITORING, BIOINDICATORS
 0105 JESSE, SAMPLING, RIVERS, OIL SHALE, OIL INDUSTRY, LAKES, CONCENTRATIONS, *ESTONIA
 0110 " SOURCES, REFINERIES, HYDROCARBONS, ESTUARIES, CRANKCASE OIL, CONTAMINATION,
 CONCENTRATIONS, *URBAN SYNOPSIS
 0177 " SPILL CLEANUP, SKINNERS, PATENT, OIL-WATER SEPARATION, EQUIPMENT
 0243 " REGULATIONS, POLLUTION CONTROL, OIL DISCHARGES, INDUSTRIES, CALIFORNIA
 0245 " RED SEA, POLLUTION CONTROL, OIL INDUSTRY, MONITORING, MARINE ORGANISMS,
 INTERNATIONAL AGREEMENTS, ECOSYSTEMS, *ALESCO

0304 WASTEWATERS, TOXICITY, REFINERIES, FUEL OIL, CRUSTACEANS, *GRASS SHRIMP
0367 " MARINE ENVIRONMENT, INDUSTRIES, CONTAMINATION, BENTHOS
0398 " SUBLETHAL EFFECTS, REFINERIES, MARINE ORGANISMS, HYDROCARBONS, *FAT, ACUTE
EFFECTS, ESTUARIES
0464 " TEXAS, SEDIMENTS, OIL FIELDS, MARINE ORGANISMS, HYDROCARBONS, CONCENTRATIONS,
BENTHOS, *BRINES
0482 " SOURCE IDENTIFICATION, SAMPLING, OIL-WATER SEPARATION, CHEMICAL ANALYSIS,
*PROCEEDINGS
0502 " OIL DISCHARGES, LEAKAGE, INDUSTRIES, GROUNDWATER, DISPOSAL, CONTAMINATION
0598 " TOXICITY, OIL SHALE, FISH, EXTRACTION, *RAINBOW TROUT, *PACIFIC MINNOWS
0601 " USSR, TAR, OIL SHALE, HEALTH HAZARDS, EXTRACTION, CARCINOGENS, *PHENOLS, *ESTONIA
0603 " PAH, OIL SHALE, MUTAGENS, HEALTH HAZARDS, EXTRACTION, CRUDE OIL
0605 " OIL SHALE, METABOLISM, EXTRACTION, CONCENTRATIONS, BIOLOGICAL EFFECTS
0606 " TOXICITY, PRODUCTION, OIL SHALE, METABOLISM, EXTRACTION, MAMMALS, *RATS
0610 " TOXICITY, OIL SHALE, EXTRACTION, CHEMICAL EFFECTS, CHEMICAL ANALYSIS, WATER QUALITY
0617 " HYDROCARBONS, DETECTION, *IONIZATION
0618 " WASTE OIL, SOCIOECONOMIC EFFECTS, REUSE, REFINERIES, OIL FIELDS, WATER QUALITY,
*BAVARIA, *BEER, *TOURISM
0652 " ONSHORE IMPACTS, ENVIRONMENTAL EFFECTS, DISPOSAL, CANADA, *DRILLING MUDS, *ALBERTA
0658 " ONSHORE, OIL WELLS, OIL INDUSTRY, OIL FIELDS, LAKES, GROUNDWATER, ENVIRONMENTAL
EFFECTS, DISPOSAL, WILDLIFE, *PLAYAS
0703 " REFINERIES, POLLUTION CONTROL, *EFFLUENT COMPARISONS
0708 " SAMPLING, REFINING, CONTAMINATION, CHEMICAL ANALYSIS
0709 " SAMPLING, REFINING, EPA, *PRIORITY POLLUTANTS
0712 " WASTE OIL, LAND FARMING, INDUSTRIES, DISPOSAL
0713 " WASTE OIL, SOURCE IDENTIFICATION, MONITORING, *HARD EARTH TAGGING
0717 " WASTE OIL, RECLAMATION, LAND FARMING, FUEL OIL, DISPOSAL, BIODEGRADATION
0721 " WASTE OIL, LAND FARMING, INDUSTRIES, DISPOSAL, BOOK REVIEW
0725 " SPILL CLEANUP, SOLID WASTES, INCINERATION, *DETOXIFICATION
0730 " OIL-WATER SEPARATION, INDUSTRIES, FLOTATION, EQUIPMENT, EMULSIONS,
ADSORPTION
0737 " TOXICITY, REFINERIES, BIOLOGICAL EFFECTS, *TOXICITY TESTING
0170 WASTEWATER TREATMENT, SORBENTS, PATENT, OIL-WATER SEPARATION, ADSORPTION, *KAPOK FIBERS
0407 " AROMATIC HYDROCARBONS, ADSORPTION, *ACTIVATED CARBON
0698 " TOXICITY, REFINERIES, MARINE ENVIRONMENT, EUROPE, DISPOSAL
0700 " PATENT, OIL-WATER SEPARATION, OIL REMOVAL, CONTAMINATION, COALESCENCE
0701 " PETROCHEMICALS, CONTAMINATION, AROMATIC HYDROCARBONS, *STYRENE MONOMER FACILITY
0702 " SLUDGE, REFINERIES, OIL-WATER SEPARATION, FLOCCULATION, CONTAMINATION,
BIODEGRADATION
0704 " REFINERIES, OIL-WATER SEPARATION, OIL REMOVAL
0705 " SOLID WASTES, REFINERIES, ACTIVATED SLUDGE, *ACTIVATED CARBON
0706 " SOLID WASTES, REFINERIES, ACTIVATED SLUDGE, *ACTIVATED CARBON
0707 " SOLID WASTES, REFINERIES, ACTIVATED SLUDGE, *ACTIVATED CARBON
0710 " REFINERIES, ECONOMICS, COST ANALYSIS, *ACTIVATED CARBON
0714 " REFINERIES, FILTRATION, ADSORPTION, *ACTIVATED CARBON
0715 " REFINERIES, PETROCHEMICALS, BIOLOGICAL TREATMENT
0716 " OIL REMOVAL, EMULSIONS, CONTAMINATION, ADSORPTION
0719 " WASTE OIL TREATMENT, INDUSTRIES, ECONOMICS, *CAPABILITIES
0722 " OIL REMOVAL, INDUSTRIES, *ULTRAFILTRATION, *REVERSE OSMOSIS
0723 " SOLID WASTES, REFINING, EXTRACTION, ENVIRONMENTAL EFFECTS
0726 " SLUDGE, OIL REMOVAL, INDUSTRIES, BIOLOGICAL TREATMENT
0029 WATER QUALITY, SAMPLING, DETECTION, CHEMICAL ANALYSIS, BIOINDICATORS, BIOASSAY
0476 " OIL SPILLS, LEAKAGE, GROUNDWATER
0610 " WASTEWATERS, TOXICITY, OIL SHALE, EXTRACTION, CHEMICAL EFFECTS, CHEMICAL ANALYSIS
0618 " WASTEWATERS, WASTE OIL, SOCIOECONOMIC EFFECTS, REUSE, REFINERIES, OIL FIELDS,
*BAVARIA, *BEER, *TOURISM
0619 " PRODUCTION, OFFSHORE, GULF OF MEXICO, EXPLORATION, ECONOMIC EFFECTS, ATLANTIC COAST
0636 " SOCIOECONOMIC EFFECTS, OIL SHALE, HABITATS, ENVIRONMENTAL EFFECTS, WILDLIFE
0115 WEATHERING, SOURCE IDENTIFICATION, SAMPLING, HYDROCARBONS, GC/MS
0116 " SPECTROSCOPY, SOURCE IDENTIFICATION, CHEMICAL ANALYSIS, ANALYTICAL TECHNIQUES,
*CORRELATION COEFFICIENTS
0118 " USCG, SOURCE IDENTIFICATION, OIL SPILLS, ANALYTICAL TECHNIQUES, *COMPUTERIZED
PATTERN RECOGNITION
0129 " SOURCE IDENTIFICATION, NATURAL SEEPAGE, MONITORING, CRUDE OIL, CHEMICAL ANALYSIS
0404 " PHYSICAL EFFECTS, INTERTIDAL ZONE, DISPERSION, BEACHES, *MECHANICAL DISPERSAL
0418 " TOXICITY, SEDIMENTS, SEDIMENTATION, BEHAVIOR, AMOCO CADIZ SPILL
0419 " TOXICITY, SHORELINES, CONTAMINATION, AMOCO CADIZ SPILL
0510 " PETROLEUM PRODUCTS, BURNING, ARCTIC, *CHEMICAL-PHYSICAL ASPECTS, *COMBUSTIBILITY,
*RESIDUAL OILS
0555 " SPREADING, SPILL TRAJECTORIES, PREDICTIONS, MOVEMENT, MODELS, CONCENTRATIONS
0575 " OIL SLICKS, NORTH SEA, FATE, EKOFISK BLOWOUT, CRUDE OIL
0588 " PHYSICAL ASPECTS, PETROLEUM PRODUCTS, MARINE ENVIRONMENT, FATE, CHEMICAL EFFECTS,
BIODEGRADATION, BEHAVIOR
0589 " SEDIMENTATION, SEA SURFACE, OIL SPILLS, MICROORGANISMS, FATE, DISPERSION,
BIODEGRADATION

0594 WEATHERING, CRUDE OIL, CHEMICAL ANALYSIS, BIODEGRADATION, *COMPOSITION
 0206 WILDLIFE, SPILL RESPONSE, GOVERNMENT AGENCIES, CONTINGENCY PLANNING, *USFWS
 0212 " SPILL RESPONSE, PERSONNEL TRAINING, GOVERNMENT AGENCIES, CONTINGENCY PLANNING,
 BIOLOGICAL EFFECTS, *USFWS, *WORKSHOP
 0247 " RESTORATION, POLLUTION PREVENTION, HABITATS, BIRDS
 0259 " TOXICITY, DISPERSANTS, CRUDE OIL, BIRDS, BIOLOGICAL EFFECTS, *CORPUS 9527,
 *MALLARD DUCKS
 0288 " TOXICITY, MORTALITY, HYDROCARBONS, CHRONIC EFFECTS, BIRDS, ANALYTICAL TECHNIQUES,
 ACUTE EFFECTS
 0359 " EPA, ENVIRONMENTAL EFFECTS, ECOSYSTEMS, BIOLOGICAL EFFECTS, *USFWS
 0449 " OFFSHORE, FISHERIES, DEVELOPMENT, COASTS, BEAUFORT SEA, BASELINE STUDIES, ALASKA
 0611 " ONSHORE, FISH, DEVELOPMENT, CANADA, BIOLOGICAL EFFECTS, *ALBERTA
 0628 " OIL INDUSTRY, HABITATS, ENVIRONMENTAL EFFECTS, ALASKA
 0636 " WATER QUALITY, SOCIOECONOMIC EFFECTS, OIL SHALE, HABITATS, ENVIRONMENTAL EFFECTS
 0658 " WASTEWATERS, ONSHORE, OIL WELLS, OIL INDUSTRY, OIL FIELDS, LAKES, GROUNDWATER,
 ENVIRONMENTAL EFFECTS, DISPOSAL, *PLAYAS
 0679 " TRANS-ALASKA PIPELINE, REGULATIONS, PIPELINES, GOVERNMENT AGENCIES, FISH
 0023 WSP, SPECTROMETRY, SEAWATER, ENGLISH CHANNEL, DETECTION, CONCENTRATIONS, AMOCO CADIZ
 SPILL
 0055 " SOLUTION, SEAWATER, MARINE ORGANISMS, CRUDE OIL, BIOLOGICAL EFFECTS
 0061 " SEAWATER, CRUDE OIL, CHEMICAL ANALYSIS, AMOCO CADIZ SPILL
 0272 " TOXICITY, SUBLETHAL EFFECTS, FUEL OIL, BEHAVIOR, AROMATIC HYDROCARBONS, *BARNACLE
 LARVAE
 0280 " MOLLUSKS, HYDROCARBONS, CONCENTRATIONS, CALIFORNIA, BIOLOGICAL EFFECTS, *BYSSAL
 THREAD FORMATION
 0290 " TOXICITY, MORTALITY, CRUSTACEANS, BIOLOGICAL EFFECTS
 0335 " TOXICITY, FUEL OIL, CRUSTACEANS, CONCENTRATIONS, CHRONIC EFFECTS, *MUD CRABS
 0374 " PHYTOPLANKTON, HYDROCARBONS, CONCENTRATIONS, BIOASSAY, ALGAE
 0377 " PETROLEUM PRODUCTS, FISH, METABOLISM, *CARP, *LIPIDS
 0379 " MORTALITY, HYDROCARBONS, GROWTH, FISH, DEVELOPMENT, *FUNDULUS HETEROCLOTUS
 0382 " GROWTH, FISH, DEVELOPMENT, CRUDE OIL, CONCENTRATIONS, *PACIFIC HERRING, *EMBRYOS
 0399 " UPTAKE, METABOLISM, FOOD WEB, CRUDE OIL, BIOLOGICAL EFFECTS, *RETENTION
 0278 YEASTS, TOXICITY, OXIDATION, MUTAGENS, FUEL OIL, *PHOTOPRODUCTS
 0086 ZOOPLANKTON, SAMPLING, CHEMICAL ANALYSIS, AROMATIC HYDROCARBONS, AMOCO CADIZ SPILL
 0109 " SAMPLING, DETECTION, BIOGENIC HYDROCARBONS, AROMATIC HYDROCARBONS, ANIMALS,
 ANALYTICAL TECHNIQUES
 0271 " NORTH SEA, FISH, EKOFISK BLOWOUT, BIOLOGICAL EFFECTS, *EGGS AND LARVAE
 0295 " PHYTOPLANKTON, CRUDE OIL, BIOLOGICAL EFFECTS, ARCTIC, *TUNDRA PONDS
 0305 " SUBLETHAL EFFECTS, PRODUCTION, BIOLOGICAL EFFECTS, AMOCO CADIZ SPILL, *WESTON,
 *RESPIRATION
 0376 " FRANCE, COASTAL WATERS, BIOMASS, BIOLOGICAL EFFECTS, AMOCO CADIZ SPILL
 0551 " WASHINGTON, SOURCES, SEDIMENTS, FISH, FATE, CONCENTRATIONS, CHEMICAL EFFECTS, BAYS,
 *FECAL PELLETS

AUTHOR INDEX

Abarnou, A.	0354	Bancroft, K.C.C.	0402
Abdelnour, R.	0196	Barkley, W.	0599
Abe, K.	0146	Barrett, R.T.	0264
Abramov, O.J.	0036	Sacrientos, C.S.	0555
Acker, J.R.	0147	Barszcz, C.	0265
Acosta, J.	0415	Barszcz, C.A.	0401
Addison, R.P.	0461	Bartha, R.	0424
Ahmadjian, M.	0058	Bartha, R.	0520
Aiken, D.E.	0255	Bartha, R.	0521
Ainley, D.G.	0256	Basile, B.	0604
Akiyama, T.	0148	Battaglia, B.	0266
Albaiges, J.	0115	Battelle Pacific NW Lab	0152
Albers, P.H.	0257	Batterton, J.C.	0267
Albers, P.H.	0258	Bayne, B.L.	0268
Albers, P.H.	0259	Beach, R.L.	0198
Albrecht, P.	0115	Bean, R.M.	0051
Alexander, S.K.	0260	Bean, R.M.	0053
Alexander, V.	0261	Beasley, M.D.	0022
Allcorn, S.F.	0137	Becker, S.W.	0690
Allcorn, S.F.	0729	Beilois, P.	0467
Allen, A.A.	0149	Belisle, A.A.	0069
Allen, A.A.	0150	Bellantoni, J.	0199
Allen, G.	0462	Bellantoni, J.	0200
Anderson, A.D.	0598	Send, J.R.	0269
Anderson, A.D.	0606	Bengert, G.A.	0062
Anderson, C.P.	0102	Benoit, F.M.	0054
Anderson, J.W.	0051	Bentz, A.P.	0037
Anderson, J.W.	0108	Bentz, A.P.	0102
Anderson, J.W.	0426	Bentz, A.P.	0117
Anderson, J.W.	0427	Bentz, A.P.	0118
Anderson, J.W.	0428	Benusa, W.P.	0099
Anderson, J.W.	0643	Benville, P.E., Jr.	0055
Antibus, R.K.	0344	Bercha, P.G. & Assoc	0201
Appan, S.G.	0647	Bergman, H.L.	0598
Arctic Biological Station	0463	Bergsteen, P.	0516
Arlauskas, J.	0397	Berka, M.	0032
Armant, D.R.	0737	Berry, R.J.	0468
Armstrong, H.W.	0464	Berry, W.O.	0270
Atlas, R.M.	0079	Bertrand, A.E.V.	0691
Atlas, R.M.	0378	Bey, F.	0370
Atlas, R.M.	0429	Bhanagar, R.S.	0469
Atlas, R.M.	0515	Bhandare, M.V.	0405
Atlas, R.M.	0573	Bianchi, A.	0351
Atwood, D.K.	0465	Biehl, E.R.	0072
Audunson, T.	0574	Bierl, R.H.	0056
Audunson, T.	0575	Bingham, E.	0599
Augenfeld, J.M.	0426	Binot, J.	0214
Augenfeld, J.M.	0427	Birnie, P.W.	0623
Augenfeld, J.M.	0428	Bishoi, P.R.	0716
Awad, H.	0262	Bishop, J.M.	0202
Awad, H.H.	0541	Biswas, A.K.	0470
Azam, F.	0307	Bjork, H.	0271
API	0572	Blaylock, J.W.	0051
APOA	0197	Blaylock, J.W.	0053
Badawy, M.I.	0407	Blundo, R.	0272
Baer, C.D.	0116	Bobra, A.	0403
Baerselman, R.	0380	Bocard, C.	0577
Bahloul, S.K.	0151	Bocher, J.	0376
Bailey, E.	0632	Boehm, P.	0343
Bailhache, J.	0244	Boehm, P.D.	0057
Baker, G.G.	0699	Bogovski, P.A.	0600
Baker, J.N.	0466	Bogovski, P.A.	0601
Baker, R.A.	0052	Bommarito, J.J.	0046
Baker, R.A.	0576	Bonilla, J.	0430
Baker, W.C.	0633	Bonus, H.	0420
Bakhitova, L.M.	0607	Bott, T.L.	0273
Bakke, T.	0263	Bourne, W.R.P.	0203
Bakken, E.	0331	Bourne, W.R.P.	0274
		Bourne, W.R.P.	0471
		Bourne, W.R.P.	0681

Bowen, R.	3127
Bowman, A.S.	0275
Bracco, S.M.	0682
Braton, M.R.	0147
Brenner, S.	0430
Breslin, M.K.	0154
Bretherick, L.	0131
Brittle, A.L.	0276
Brit Advis Comm Oil Pol Sea	0472
Brit Advis Comm Oil Pol Sea	0473
British Petroleum Co	0662
Brooks, J.M.	0738
Brown, C.W.	3058
Brown, C.W.	0116
Brown, C.W.	0119
Brown, D.S.	0412
Brown, J.W.	0100
Brown, J.L.	0522
Brown, J.L.	0535
Brown, L.R.	3003
Brown, L.R.	3004
Brown, L.R.	3059
Brown, L.R.	0265
Brown, L.R.	0300
Brown, P.J.	0409
Brown, P.J.	0485
Brown, P.J.	0596
Brown, R.A.	0060
Brown, R.A.	0096
Brown, R.A.	0097
Brownrigg, J.F.	0095
Bruderly, D.E.	0701
Brugge, J.E.	0725
Buchart, A.	0018
Buckley, D.E.	0418
Buckley, D.E.	0419
Buckley, D.E.	0512
Buikema, A.L.	0304
Buikema, A.L., Jr.	0737
Bulkley, R.V.	0340
Bunch, J.W.	0431
Bunch, J.S.	0517
Burchard, R.P.	0397
Buresh, R.J.	0287
Burke, T.	0452
Burn, K.	0136
Bushosh, M.	0277
Butler, E.I.	0086
Butler, J.W.	0578
Butts, E.O.	0005
BP Oil Ltd	0153
C-CORE	0205
Cabioca, L.	0404
Cadbury, C.J.	0279
Cadbury, C.J.	0318
Cairns, J., Jr.	0304
Cairns, J., Jr.	0737
Calabaria, D.	0739
Calder, J.A.	3061
Calisti, L.J.	0295
Calien, D.F.	0278
Calvin, D.W.	0727
Cameron, J.A.	0381
Cameron, J.A.	0382
Campbell, G.W.	0549
Campbell, G.S.	0548
Campbell, L.H.	0279
Canadian Petroleum Assoc	0132
Canevari, G.P.	0204
Cantaveil, S.G.	0535
Carlson, R.D.	0299
Carpenter, R.	0551
Carr, R.S.	0280
Carsin, J.-L.	0083
Castle, R.W.	0155

Castle, R.W.	0183
Centre Nat l'Exploit Oceans	0038
Chamberlain, C.P.	0122
Chambers, J.E.	0281
Chambers, J.E.	0282
Chambers, J.E.	0283
Chan, H.S.	0260
Chang, C.	0284
Chang, E.S.	0604
Chassis, S.	0634
Chasse, C.	0474
Chasse, C.	0475
Chau, Y.K.	0062
Chen, H.	0284
Cheng, T.Y.	0006
Chesler, S.W.	0074
Chesler, S.W.	0076
Chesler, S.W.	0111
Chuang, M.T.	0006
Chevalier, R.	0702
Chien, Y.T.	0120
Childers, R.A.	0679
Chin, B.H.	0285
Chung, E.K.	0723
Clark, D.T.	0476
Clements, L.E.	0389
Cline, J.D.	0579
Cocchio, W.	0542
Cohen, C.H.	0133
Cohen, Y.	0542
Cole, H.A.	0477
Coleman, J.B.	0104
Collier, T.C.	0350
Collier, T.K.	0087
Collier, T.K.	0286
Colonelli, J.M.	0687
Colwell, R.F.	0518
Colwell, R.R.	0750
Conan, G.	0478
Corbett, C.B.	0206
Cornack, D.	0134
Cornack, D.	0156
Cornack, D.	0580
Cornack, D.	0581
Cornillon, P.C.	0563
Costello, J.	0602
Courtot, P.	0089
Cowell, E.B.	0007
Cowell, E.B.	0157
Cowell, E.B.	0421
Cox, G.V.	0421
Cox, J.C.	0553
Crane, J.D.	0701
Cranshaw, J.	0311
Crececius, E.A.	0426
Crececius, E.A.	0427
Crececius, E.A.	0428
Cretney, W.J.	0063
Crisafulli, A.J.	0158
Crutchfield, J.A., Jr.	0635
Cueman, M.K.	0050
Cummings, B.A.	0519
CNEIO	0039
CONCAWE	0677
CONCAWE	0703
CONCAWE	0406
D'Ozouville, L.	0462
D'Ozouville, L.	0478
D'Ozouville, L.	0112
D'Silva, A.P.	0104
Dahneke, B.E.	0007
Dalby, D.B.	0432
Dames	0433
Daniel, J.Y.	0176
Daniel, L.E., Jr.	0550

Dauvin, J.-C.	0404	Fall, R.E.	0522
Davenport, C.V.	0385	Fall, R.E.	0535
Davies, B.T.	0704	Farrier, D.S.	0598
Davies, J.M.	0494	Farrier, D.S.	0605
Davis, M.	0749	Farrington, J.W.	0481
Davis, P.H.	0386	Farrington, J.W.	0543
Dawe, L.L.	0532	Fassel, V.A.	0112
Dawson, M.E.	0098	Faw, G.M.	0523
Day, T.	0479	Federle, T.W.	0295
De Pastovich, T.L.	0233	Fee, J.	0291
Decora, A.W.	0636	Feeley, R.A.	0435
Demars, K.R.	0678	Fehon, W.C.	0524
Dept of Trade, Gr Britain	0603	Feldman, I.	0104
Dept Fisheries & Env Canada	0683	Fenco Consultants Ltd	0210
Dept Fisheries & Env Canada	0634	Fiest, D.	0057
Desaunay, Y.	0467	Fingas, M.F.	0040
Deslauriers, P.	0434	Fischer, I.A.	0596
Desty, D.H.	0131	Fisher, J.W.	0270
Devanney, J.W.	0664	Flanigan, G.A.	0122
DeAndres, J.R.	0415	Fleischer, C.A.	0622
DeGraeve, G.E.	0598	Fletcher, A.E.	0235
DeLaune, H.D.	0287	Fletcher, G.L.	0324
Dhargalkar, V.K.	0405	Flotard, R.D.	0710
Dibble, J.T.	0424	Fondekar, S.P.	0066
Dibble, J.T.	0520	Fontanel, A.	0010
Dibble, J.T.	0521	Ford, S., Jr.	0725
Dick, D.L.	0610	Ford, R.A.	0211
Dieter, M.P.	0298	Ford, D.L.	0710
Dieter, M.P.	0365	Fore, P.L.	0212
Dieter, M.P.	0390	Fortier, S.H.	0078
Diaock, C.	0127	Fortier, S.H.	0121
Direction des Ports-Mar Har	0207	Fossato, V.J.	0067
Distler, T.W.	0386	Fotheringham, P.	0623
Divavin, I.A.	0289	Fowler, J.E.	0175
Dobbs, J.	0303	Frame, G.H.	0122
Dobbs, J.C.	0294	Fraser, G.T.	0243
Donahue, W.H.	0290	Fraser, J.P.	0213
Donaldson, E.C.	0637	Frei, B.W.	0482
Donohue, M.J.	0208	Fried, J.J.	0557
Dorel, D.	0467	Fryxell, G.A.	0738
Dorina, M.V.	0377	Fucik, K.W.	0379
Dorrler, J.S.	0209	Fujisawa, H.	0296
Dowsett, B.O.	0134	Fujisawa, H.	0358
Dunn, B.P.	0291	Funk, R.S.	0163
DGMK/Deutsche Gesellschaft	0064	Mertelvon, A.B.	0700
DOE, Canada	0159	Gaffney, J.S.	0123
DOE, UK	0008	Gantz, A.	0030
Eagle, G.A.	0065	Gardner, W.S.	0525
Eastin, W.C., Jr.	0292	Garg, M.	0516
Eastman Kodak Co	0582	Garlitz, J.	0199
Eastwood, D.	0121	Garlitz, J.	0200
Eaton, P.	0009	Garrett, W.D.	0068
Edgerton, A.	0046	Garrison, L.E.	0745
Eglinton, G.	0031	Gary, J.H.	0639
Ehrhardt, M.	0740	Gaskell, T.	0483
Eisler, B.	0293	Gastaud, J.M.	0297
El-Dib, M.A.	0407	Gatellier, C.	0351
Ellingsen, E.	0271	Gatellier, C.	0570
Elliot, H.A.	0546	Gatellier, C.	0577
Ellis, R.D.	0160	Gay, M.L.	0069
Elagren, E.	0302	Geisbuhler, T.	0516
Elagren, E.	0343	Gennaro, R.N.	0527
Emergetex Engineering	0234	Gentil, P.	0404
Eng, P.	0614	Gerasimenko, D.D.	0298
Engel, S.E.	0294	Gerhart, E.H.	0299
Environ Protect Svc Canada	0161	Geyer, R.A.	0583
Epler, J.L.	0603	Geyer, R.A.	0584
Espinosa, H.	0544	Giam, C.S.	0260
Evans, J.A.	0227	Giering, L.P.	0095
Evers, C.P.	0102	Giger, W.	0070
Exxon Chemical Co	0162	Giger, W.	0107
Exxon Corp	0480	Gilbert, P.D.	0526
Exxon Corp	0638	Giles, R.C.	0300
Exxon Corp	0665	Gilfillian, E.S.	0585
F.F. Slaney & Co Ltd	0210	Gill, S.D.	0164

Ginsberg, P.	0130	Hayes, W.O.	0404
Glover, H.L.	0717	Hayes, W.O.	0405
Gochfeld, H.	0436	Hayes, W.O.	0597
Goss, G.	0544	Heimann, K.	0735
Gosperts, P.	0125	Heitz, J.R.	0003
Goodman, R.D.	0011	Heitz, J.R.	0281
Goodman, R.H.	0012	Heitz, J.R.	0282
Gordon, H.H.	0042	Heitz, J.R.	0283
Gordon, H.C.	0185	Hendrikson, P.	0305
Gordon, H.C.	0519	Heinig, H.F.-K.O.	0073
Gorman, W.L.	0301	Henry, C.	0215
Gorsline, J.	0310	Hentic, G.	0402
Gorsline, J.	0311	Henry, T.L.	0013
Gouze, J.	0214	Hervin, R.D.	0413
Grafio, A.P.	0109	Herranz, P.	0415
Grabl-Nielsen, O.	0071	Hertz, H.S.	0074
Grabl-Nielsen, O.	0596	Hertz, H.S.	0076
Granger, E.H.	0437	Hertz, H.S.	0111
Grassie, J.P.	0302	Hess, L.V.	0731
Grassie, J.P.	0302	Hess, R.E.	0216
Gras, C.R.	0256	Heyerdaal, T., Jr.	0014
Gras, C.R.	0294	Heyerdaal, T., Jr.	0410
Gras, C.R.	0303	Heyerdaal, T., Jr.	0641
Gras, C.R.	0400	Higashinara, T.	0075
Gray, A.L.	0043	Higgins, I.J.	0526
Green, A.	0065	Hildebrand, P.	0196
Grievess, C.J.	0705	Hildebrand, P.B.	0150
Grievess, C.J.	0706	Hill, G.	0558
Grievess, C.J.	0707	Hilpert, L.B.	0076
Griffiths, H.C.	0236	Hilpert, L.B.	0111
Griffiths, H.P.	0438	Hircho, H.J.	0305
Gruger, G.H.	0442	Hirchow, H.	0306
Grutsch, J.F.	0706	Hirsch, K.V.	0400
Grutsch, J.F.	0707	Hirsch, K.	0326
Grzywaczewski, Z.	0237	Hites, H.A.	0044
Guerin, H.R.	0603	Hites, H.A.	0124
Guerrero, H.	0072	Hodgins, W.O.	0442
Gulan, J.A.	0545	Hodgson, G.W.	0077
Guschnikov, V.P.	0377	Hodgson, T.J.	0556
Gundlach, E.R.	0406	Hodson, H.E.	0307
Gustajtis, K.A.	0559	Hoffman, D.J.	0308
Guzdar, A.	0166	Hoffman, D.J.	0309
JZ	0041	Hoffman, E.J.	0078
GESAMP	0640	Holdgate, H.W.	0486
Hadley, D.	0391	Hollaway, S.L.	0523
Hagstrom, B.A.	0345	Holligan, P.W.	0086
Hahn, H.E.	0400	Holme, H.A.	0411
Hall, C.	0434	Holmes, H.L.	0579
Hall, L.W.	0304	Holmes, W.H.	0310
Hallett, J.D.	0708	Holmes, W.H.	0311
Hallett, J.D.	0709	Horowitz, A.	0073
Hanson, J.	0238	Bradley, S.E.	0614
Hanson, G.R.	0425	Huang, C.P.	0546
Hampton, H.R.	0745	Hudson, J.O.	0720
Hanishak, H.D.	0388	Huffman, H.L., Jr.	0060
Hann, P.W., Jr.	0686	Huhnerfuss, H.	0547
Hanson, S.A.	0585	Hundemann, A.G.	0044
Hanus, J.P.	0072	Hunter-Blair, A.	0487
Harby, R.	0086	Hunter, J.V.	0110
Harby, R.	0128	Hunter, J.V.	0125
Harby, R.	0494	Hyland, J.L.	0312
Harland, E.C.	0517	Hyland, J.L.	0313
Harvey Associates	0165	Ignatiades, L.	0314
Harris, E.F.	0657	Indrebo, G.	0315
Harris, G.W.	0408	Irwin, W.A.	0735
Harris, H.	0439	Ishikawa, K.	0146
Harrison, W.	0710	Itra, A.R.	0105
Hart, F.C.	0692	Iversen, S.L.	0017
Hart, S.	0556	Iverson, S.A.	0271
Harvey, A.	0166	Ivey, J.W.	0612
Hastie, J.J.	0652	Izgorova, T.I.	0393
Hater, G.B.	0295	IOC	0015
Hater, J.B.	0355	IOC	0016
Hawkins, H.K.	0043	Jackin, E.	0587
Hay, K.G.	0239	Jadawec, J.R.	0078

Jadasec, J.D.	0080	Lake, J.	0061
Jadasec, J.E.	0095	Lake, J.L.	0127
Jainson, V.E.	0720	Lampe, D.	0168
Janes, E.J.	0613	Lange, P.	0547
Jansen, E.J.	0167	Langfeldt, J.B.	0191
Jennison, E.J.	0100	Lannergrén, C.	0332
Jennison, S.H.	0310	Lannergrén, C.	0333
Jensen, A.C.	0488	Lapeyre, C.	0244
Jensen, V.E.	0018	Larson, B.A.	0278
Jewell, D.E.	0099	Laseter, J.L.	0061
Joannessen, S.	0370	Laseter, J.L.	0094
Johansen, P.	0018	Laseter, J.L.	0501
Johanson, D.L.	0652	Laskin, A.I.	0172
Johanson, J.J.	0317	Lau, Y.L.	0135
Johanson, J.W.	0527	Laubier, L.	0491
Johnston, R.	0489	Laughlin, R.B., Jr.	0334
Jones, P.B.	0318	Laughlin, R.B., Jr.	0335
Jorian, R.E.	0588	Laurson, G.A.	0344
Jungmans, G.	0305	Lauziere, G. de la	0660
Kaplan, L.B.	0081	Law, R.J.	0085
Kaplan, I.B.	0430	Law, R.J.	0492
Kaplan, I.B.	0615	Le Bel, G.L.	0054
Kaplan, J.B.	0082	Le Lourd, P.	0218
Karickhoff, S.W.	0412	Le Lourd, P.	0240
Karinen, J.F.	0447	Leask, L.E.	0679
Karrick, W.L.	0442	Lebsack, M.E.	0598
Karydis, R.	0319	Lech, J.J.	0353
Karydis, R.	0320	Lee, R.P.	0307
Kashimoto, T.	0090	Lee, R.F.	0336
Kaster, A.G.	0321	Lee, R.F.	0525
Kaster, A.G.	0746	Lee, R.F.	0589
Kasymov, A.G.	0322	Lee, W.Y.	0290
Katasonova, N.P.	0377	Lee, W.Y.	0337
Katayama, A.	0323	Lefever, C.A.	0325
Kattavar, G.W.	0545	Lemoine, A.	0467
Katz, E.	0019	Leung, S.W.	0006
Keepamerke, T.	0618	Leung, T.S.	0340
Kendall, S.E.	0402	Leviton, W.M.	0341
Kenner, C.T.	0072	Levy, E.M.	0020
Kerouel, R.	0083	Levy, E.M.	0021
Kerr, R.D.	0636	Levy, E.M.	0342
Kiconiak, J.W.	0324	Levy, E.M.	0418
Kierass, T.	0217	Levy, E.M.	0419
Kiesner, S.L.	0051	Levy, E.M.	0512
King, F.	0711	Levy, E.M.	0742
King, H.A.	0325	Lewbel, G.S.	0749
King, H.A.	0326	Lewis, J.	0493
King, H.E.	0528	Lewis, J.B.	0241
Kirby, H.E.	0045	LeDrew, B.	0217
Klavertamp, J.F.	0327	LeDrew, B.R.	0554
Klavestid, N.	0490	LeFevre, J.	0376
Klock, R.	0664	LeFevre, J.	0693
Knap, W.M.	0126	LeFevre, J.	0741
Kodis, R.	0199	LePennel, U.	0338
Kodiu, R.	0200	LeRoux, S.	0338
Konaldson, E.C.	0642	LeRoux, S.	0339
Kooyman, G.	0440	Libni, A.	0360
Korn, S.	0328	Lichte, H.W.	0242
Korn, S.	0447	Likhodeyeva, N.P.	0322
Kossan, A.	0171	Lin, J.D.	0548
Koutsky, J.A.	0147	Lin, J.D.	0549
Kovacs, A.	0441	Linden, O.	0343
Kramar, O.	0062	Lindemuth, W.T.	0133
Krichewsky, N.I.	0079	Linkins, A.E.	0344
Krogh, F.	0574	Livingstone, D.B.	0264
Kusota, A.	0103	Ljoen, B.	0550
Kump, H.E.	0619	Lo, C.C.	0006
Kurashv, T.E.	0405	Lobov, L.I.	0036
L'Yavane, J.	0462	Loehr, R.C.	0712
Lacaze, J.C.	0329	Lombard, W.K.	0169
Lacaze, J.C.	0330	Long, B.	0512
Lafosse, W.E.	0084	Long, B.F.N.	0418
Lafosse, S.E.	0124	Long, B.F.N.	0419
Lau-Johannessen, J.	0331	Lonning, S.	0345
Lake, C.	0547	Loya, Y.	0373

Lucas, A. 0339
 Lukas, B.B. 0560
 Lyes, M.C. 0346
 Lynch, B. 0580
 Lynch, E.F. 0058
 Lynch, E.F. 0119
 M.O. Hayes, 0400
 Mack, W. 0106
 Mackay, D. 0213
 Mackay, D. 0403
 Mackay, D. 0479
 Mackay, D. 0542
 Mackay, D. 0561
 Mackie, D.F. 0066
 Macko, S. 0326
 MacCarthy, P. 0728
 MacIntyre, A.D. 0494
 MacLeod, W.D., Jr. 0100
 Madera, A. 0170
 Mahaa, R.M. 0022
 Mahaud, L. 0715
 Mah, L.W. 0005
 Makida, M. 0093
 Malins, D.C. 0087
 Malins, D.C. 0286
 Malins, D.C. 0350
 Malins, D.C. 0442
 Malins, D.C. 0496
 Malins, D.C. 0591
 Malins, D.C. 0296
 Manabe, T. 0358
 Manabe, T. 0500
 Manajel, A.W. 0013
 Manov, D.V. 0123
 Manowitz, B. 0347
 March, G.L. 0348
 March, G.L. 0023
 Marchand, M. 0478
 Marchand, M. 0728
 Mark, H.B., Jr. 0611
 Markham, B.J. 0171
 Marshall, 0351
 Marty, D. 0177
 Masaaki, S. 0732
 Mascetti, G.J. 0494
 Massie, L. 0435
 Massoth, G.J. 0716
 Mathews, A. 0146
 Matsuda, Y. 0177
 Matsuo, Y. 0422
 Mattoon, J. 0725
 Mattox, W. 0453
 Mattson, J.S. 0497
 Maurin, C. 0366
 May, M. 0074
 May, W.E. 0076
 May, W.E. 0111
 May, W.E. 0722
 Mazlart, E.F. 0667
 McCaull, J. 0281
 McCorkle, F.M. 0282
 McCorkle, F.M. 0283
 McCorkle, F.M. 0713
 McCown, D.L. 0178
 McCracken, W.E. 0714
 McCrodder, B.A. 0243
 McGuire, M.J. 0590
 McIntyre, A.D. 0235
 McKelvey, J.A. 0347
 McKeown, B.A. 0348
 McKeown, B.A. 0495
 McL Traill, I. 0512
 McLaren, P. 0468
 McKee, E.D. 0013
 McRaney, J.K. 0349
 McRoy, C.P.

Mead, C.J. 0352
 Meeks, D.C. 0046
 Melancon, M.J. 0353
 Mellanby, A. 0493
 Mellinger, P.J. 0643
 Metge, M. 0562
 Michel, J. 0409
 Michel, J. 0485
 Michel, P. 0354
 Michon, P. 0244
 Milleditch, E.S. 0604
 Mikolaj, P.G. 0173
 Miles, D.H. 0003
 Miller, M.C. 0295
 Miller, M.C. 0355
 Miller, O.K. 0344
 Milne, A.R. 0413
 Milne, A.R. 0644
 Minakos, M. 0314
 Minchew, C.D. 0265
 Minshew, C.D. 0003
 Minshew, C.D. 0004
 Miron, H.I. 0601
 Mironov, O.G. 0289
 Mironov, O.G. 0356
 Mironov, O.G. 0357
 Misra, R. 0324
 Mitchell, C.E. 0024
 Mitchell, H. 0736
 Mitchell, W.W. 0529
 Mix, M.C. 0088
 Miyake, Y. 0091
 Miyake, Y. 0092
 Miyake, Y. 0362
 Moal, J. 0376
 Moie, P.G. 0699
 Moie, P.G. 0717
 Mogg, D.W. 0163
 Mohan, R.R. 0172
 Mohr, M.C. 0548
 Moir, J. 0135
 Monnat, J.Y. 0318
 Moore 0432
 Moore 0433
 Moore, M.H. 0268
 Morehouse, T.A. 0679
 Morel, G. 0089
 Morita, E.Y. 0438
 Morrell, S.H. 0256
 Morrison, S.M. 0519
 Moul, E.T. 0425
 Moulder, D.S. 0499
 Mulcahy, M. 0220
 Muldoon, A. 0694
 Munday, J.C. 0042
 Muntzer, P. 0557
 Muntzer, P. 0570
 Murakami, M. 0296
 Murakami, M. 0353
 Murphy, B.G. 0532
 Murray, J. 0123
 MIT 0668
 Nacci, V.A. 0678
 Nadeau, E.J. 0359
 Nadeau, S. 0479
 Nagelmackers, H.G. 0228
 Nakamura, A. 0090
 Nakashima, M. 0177
 Naslund, L.A. 0172
 Natusch, D.F.S. 0610
 Nawwar, A.M. 0196
 Neal, D.M. 0717
 Nebeker, E.B. 0173
 Needham, R. 0743
 Neff, J.M. 0334

Neff, J.M.	0335	Payne, J.F.	0366
Neff, J.M.	0379	Payne, J.A.	0599
Nelson-Smith, A.	0025	Peake, E.	0101
Nelson, D.O.	0500	Peake, E.	0136
Nelson, H.K.	0221	Pearson, T.H.	0367
Nelson, K.F.	0605	Pearson, W.H.	0027
Nelson, K.F.	0606	Pedersen, S.	0531
Neppelberg, T.	0364	Penrose, W.R.	0532
Neppelberg, T..	0394	Percy, J.A.	0368
Neville, H.A.	0026	Percy, J.A.	0369
Nevo, E.	0360	Perry, G.	0057
Newbury, T.K.	0616	Perry, J.J.	0533
Newport News Shipbuilding	0670	Petrakis, L.	0099
Nichols, J.A.	0156	Pettyjohn, W.A.	0502
Nichols, J.A.	0174	Philiponeau, P.	0503
Nichols, J.A.	0590	Pirnik, M.P.	0534
Nichols, J.A.	0581	Pistruzak, W.A.	0593
Nicol, J.	0290	Plass, G.H.	0545
Nicol, J.A.C.	0337	Pojonowski, I.C.	0175
Noll, C.J.	0563	Polovinko, V.V.	0036
Norcor Engineer & Research	0592	Popl, M.	0032
North, D.S.	0605	Possey, C..	0504
North, D.S.	0606	Posthuma, J.	0594
Northland Associates, Ltd	0444	Potter, B.B.	0028
Northland Associates, Ltd	0445	Potts, H.L.	0620
Northland Associates, Ltd	0446	Prahl, P.G.	0551
Norwood, C.	0147	Premuzic, E.T.	0123
Novick, S.	0671	Preston, W.	0484
Novitsky, T.J.	0098	Priestaf, I.	0595
Noyes, J.S.	0361	Pritchard, S.Z.	0505
NOHCO, Ltd	0443	Pritchard, S.Z.	0685
O'Brien, A.	0200	Protopapa, S.	0664
O'Brien, A., Jr.	0199	Puglisi, P.L.	0455
O'Neil, A.A.	0026	Purdie, M.	0608
Oceanographic Inst of WA	0564	Purves, W.F.	0184
Ochiai, H.	0047	Purves, W.F.	0196
Ogan, K.	0019	Putnam, W.H.	0222
Ogata, M.	0091	Quinn, J.S.	0078
Ogata, M.	0092	Radu, M.	0608
Ogata, M.	0362	Ramos, L.S.	0100
Oglesby, J.L.	0612	Rao, T.K.	0503
Okidi, C.O.	0454	Raymond, B.L.	0720
Oliver, J.D.	0524	Rayner, D.S.	0048
Olla, B.L.	0027	Reavis, M.W.	0686
Omohundiro, J.T.	0423	Reed, W.E.	0081
Onishi, T.	0093	Reed, W.E.	0082
Oudot, J.	0530	Reed, W.E.	0129
Overcash, M.B.	0718	Reed, W.E.	0615
Overton, E.B.	0094	Reid, D.F.	0738
Overton, E.B.	0501	Reid, B.H.	0645
Owen, B.	0363	Reidy, S.K.	0416
Owens, E.H.	0414	Reindl, J.	0733
Paalae, L.P.	0105	Reish, D.J.	0280
Pack, D.B., Jr.	0080	Renault, P.	0176
Pack, D.B., Jr.	0035	Renault, P.	0577
Paga, D.S.	0585	Revolle, Z.	0244
Pal, D.	0718	Reus, P.E.	0223
Palaork, K.H.	0364	Rey, J.	0415
Palaork, K.H.	0383	Reynolds, P.	0371
Palaork, K.H.	0384	Rhead, M.M.	0402
Palomo, C.	0415	Rice, S.D.	0447
Pancirov, R.J.	0096	Richards, V.L.	0609
Pancirov, R.J.	0097	Rieser, A.	0624
Parker, H.W.	0695	Riggenbach, J.D.	0701
Parker, P.L.	0326	Riggin, R.H.	0109
Pashin, Y.	0607	Risgard, H.J.	0372
Passera, A.	0199	Riley, R.	0051
Passman, F.J.	0098	Riley, R.	0426
Patel, J.E.	0501	Riley, R.	0427
Patrick, W.H.	0287	Riley, E.G.	0053
Patterson, J.	0719	Riley, E.G.	0428
Patton, J.F.	0069	Rinkevich, B.	0373
Patton, J.F.	0365	Robal, W.T.	0350
Payne, E.	0326	Robbins, M.L.	0172
Payne, G.B.	0606	Rodriguez, S.E.	0173

Hoffman, H.K.	0646	Smith, C.L.	0056
Roschke, S.C.	0374	Smith, E.F.	0724
Rosenberg, R.	0367	Smith, L.F.	0174
Ross, C.H.	0150	Smith, L.W.	0525
Ross, S.S.	0721	Smith, T.A.	0004
Rossiter, J.R.	0565	Smith, T.A.	0565
Roubal, W.T.	0047	Smith, T.L.	0381
Roudybush, T.	0303	Smith, T.L.	0382
Roudybush, T.E.	0256	Snowdon, L.R.	0101
Roudybush, T.E.	0294	Soikkeli, V.	0507
Roudybush, T.E.	0400	Solbakken, J.E.	0364
Rout, C.	0176	Solbakken, J.E.	0383
Roussel, A.	0010	Solbakken, J.E.	0384
Royal Soc for Protect Birds	0375	Solsberg, L.B.	0179
Ruby, C.H.	0596	Solsberg, L.B.	0183
Ruby, C.H.	0597	Sonksen, H.A.	0722
Ruff, D.L.	0163	Sparrow, E.D.	0365
Ruskin, A.M.	0448	Spaulding, M.L.	0563
Putnerford, C.L.	0737	Spies, H.S.	0386
Sabatino, T.	0125	Spill Control Assoc America	0190
Sackett, W.M.	0738	Spiller, J.	0624
Sader, Z.	0245	Spooner, M.F.	0046
Sakamoto, H.	0093	Spooner, M.F.	0672
Salkeld, P.	0268	Scrivastava, C.P.	0246
Saman, J.F.	0376	Stageseyer, H.D.	0137
Sandstrom, M.A.	0081	Stageseyer, H.D.	0729
Sandstrom, M.A.	0082	Stagg, A.	0123
Sato, A.	0075	Stahl, W.J.	0538
Sauer, T.C., Jr.	0506	Standring, K.T.	0279
Savler, G.S.	0537	Stanton, P.B.	0247
Schaeffer, T.L.	0522	Staughan, D.	0391
Schaeffer, T.L.	0535	Staveland, J.T.	0387
Scharfer, E.L.	0088	Stebbing, A.A.	0029
Schaffner, C.	0107	Steele, R.L.	0384
Schaffner, C.	0070	Steen, G.L.	0673
Scheline, H.B.	0384	Stegemeier, R.	0649
Schmokel, W.	0243	Steisle, P.W.	0645
Schneider, E.D.	0313	Steinbakke, P.	0574
Schultz, L.A.	0434	Stekoll, M.S.	0389
Schultz, L.A.	0553	Stenstrom, M.A.	0706
Schwantje, E.S.	0046	Stenstrom, M.A.	0707
Schwarz, J.R.	0260	Stevens, G.	0164
Scott, T.A.	0412	Stevens, W.K.	0508
Scott, W.S.	0744	Stevens, W.K.	0650
Searl, T.D.	0096	Stevens, W.	0166
Segler, M.	0370	Stickel, L.F.	0390
Seike, Y.	0177	Stoehr, L.A.	0225
Sergeeva, M.T.	0377	Stone, J.H.	0651
Sethi, V.K.	0625	Stover, E.L.	0723
Sexstone, A.J.	0378	Stowe, T.J.	0319
Sexstone, A.J.	0536	Strain, P.J.	0181
Shanks, L.R.	0626	Strobel, C.J.	0392
Sharp, J.F.	0647	Stroscher, H.T.	0652
Sharp, J.R.	0379	Stroud, H.O.	0049
Shaw, D.G.	0389	Struhsaker, J.W.	0329
Shaw, D.G.	0416	Studds, C.W.B.	0611
Shawmont Newfoundland Ltd	0224	Su, C.-W.	0056
Shchekaturina, T.L.	0357	Sullivan, C.T.	0655
Shea, K.	0102	Sullivan, T.	0504
Sherrill, T.W.	0537	Sullivan, T.	0653
Shimony, T.	0360	Sullivan, T.	0654
Sain, J.V.	0403	Sulzberger, A.O., Jr.	0654
Shojima, T.	0177	Suzuki, Y.	0047
Sims, C.E.	0301	Svrcek, W.Y.	0716
Simonett, D.	0648	Syratt, W.J.	0007
Sinsteen, B.	0688	Systems Technology Corp	0724
Sittig, P.J.	0722	Szabo, A.G.	0048
Sizemore, R.R.	0523	Taft, J.B.	0102
Skjoldal, M.P.	0263	Tagatz, H.Z.	0412
Skogerboe, H.A.	0610	Takeda, T.	0617
Slade, J.B.	0566	Takeuchi, S.	0047
Sloorf, W.	0380	Taylor, D.A.	0610
Smayin, W.M.	0064	Taylor, H.J.	0341
Smedstad, O.	0331	Telang, S.A.	0030
Salley, B.D.	0644	Teleki, P.G.	0745

Tenore, K.R.	0525	Waldichuk, M.	0249
Tenzer, R.	0182	Waldichuk, M.	0250
Tenzer, R.	0725	Walienista, M.P.	0527
Terajima, K.	0146	Walk, J.D.	0706
Terrell, C.R.	0626	Walk, J.D.	0707
Thanarajah, J.C.	0552	Walker, E.B.	0251
Thanh, N.C.	0715	Walker, J.D.	0397
Thoes, T.L.	0657	Walker, J.D.	0518
Thomas, H.	0627	Wang, H.	0546
Thomas, L.C.	0037	Wang, W.D.	0578
Thomas, L.C.	0286	Ward, J.G.	0252
Thomas, L.C.	0350	Ward, J.M.	0185
Thompson, S.	0031	Ward, L.G.	0596
Thomson, A.B.	0128	Warner, J.S.	0108
Thomson, V.	0026	Warner, J.S.	0109
Thornton, D.E.	0417	Wathen, J.	0303
Thornton, D.E.	0567	Watt, D.S.	0535
Thurier, R.	0479	Wayment, E.C.	0186
Tindmarsh, G.B.	0133	Webb, H.G.	0131
Tokin, I.B.	0393	Weber, D.D.	0442
Tokuda, H.	0394	Weiskopf, F.B.	0553
Ton, G.	0184	Weich, M.F.	0290
Tomita, S.	0146	Wells, P.G.	0408
Tomkins, B.A.	0103	Wells, P.G.	0512
Toppi, R.S.	0066	Wendt, E.P.	0147
Toridara, T.Y.	0104	Westergaard, R.H.	0253
Travers, W.B.	0568	Westing, A.	0569
Tripp, B.W.	0543	Westrheim, K.	0071
Truett, J.C.	0449	Westrheim, K.	0586
Trunova, O.N.	0393	Whipple, J.A.	0399
Tsymbal, I.M.	0239	Whipple, W., Jr.	0110
Tuffey, T.J.	0130	White, H.M.	0732
Twardus, E.M.	0510	White, I.C.	0398
Tyler, I.	0126	White, M.D.	0532
Tyler, T.R.	0295	White, W.D.	0225
Uaino, M.	0617	Widdows, J.	0268
Univ of Rhode Island	0248	Wilhelmsen, S.	0071
Univ Delaware Coll Mar Stud	0511	Wilhelmsen, S.	0586
Uvarova, S.I.	0377	Wilkinson, P.	0395
Uzuner, M.S.	0553	Willheim, E.	0457
US DOI Bureau of Mines	0734	Williams, A.S.	0189
US Natl Transp Safety Board	0669	Williams, D.T.	0054
US NOAA	0450	Williams, J.	0065
USCG	0596	Williams, P.J. Le B.	0126
Valadez-Ferreira, B.	0456	Williams, S.L.	0349
Van Auken, O.W.	0321	Wilman, E.A.	0659
Van Auken, O.W.	0746	Wilson, M.P.	0513
Van Baalen, C.	0267	Wilton, G.	0413
Van Blaricum, G.	0749	Windsor, J.G., Jr.	0124
Van Genderen, J.L.	0050	Winter, M.	0276
Van Heijnsbergen, P.	0747	Winters, K.	0267
Vanderhorst, J.R.	0395	Wise, S.A.	0074
Vanderhorst, J.R.	0643	Wise, S.A.	0076
Vandermeulen, J.H.	0396	Wise, S.A.	0111
Vandermeulen, J.H.	0418	Wodzinski, R.J.	0527
Vandermeulen, J.H.	0419	Wolfe, D.A.	0514
Vandermeulen, J.H.	0512	Wolfe, D.A.	0748
Varley, A.	0499	Wolff, C.J.M.	0276
Vass, P.A.	0050	Wolfson, A.	0749
Veldre, I.A.	0105	Wong, P.T.S.	0062
Veldre, I.A.	0613	Woo, C.S.	0112
Venkatesan, M.I.	0081	Wootton, T.A.	0400
Venkatesan, M.I.	0082	Wyant, T.	0566
Venkatesan, M.I.	0430	Yamasaki, Y.	0092
Vestal, J.R.	0295	Yarbrough, J.D.	0265
Vestal, J.R.	0355	Yarbrough, J.D.	0281
Vestal, J.R.	0516	Yarbrough, J.D.	0282
Vinkmann, F.	0600	Yarbrough, J.D.	0283
Virtanen, J.	0507	Yehaskel, A.	0730
Vogler, M.	0658	Yen, T.P.	0539
Vose, R.W.	0704	Yen, T.P.	0540
Voznakova, Z.	0032	Yeng, T.-L.	0013
W Canada Hydraulic Labs Ltd	0187	Yeremin, V.I.	0036
Wakeham, S.G.	0106	Yevich, P.P.	0265
Wakeham, S.G.	0107	Yevich, P.P.	0401

Young, J.C.	0726
Young, L.G.L.	0335
Younkin, W.Z.	0652
Yuzurw, H.	0697
Zachary, A.	0750
Zanker, A.	0689
Zilliox, L.	0557
Zilliox, L.	0570
Zimlicki-Owens, L.M.	0192
Zitko, V.	0009
Zitko, V.	0255
Zsolnay, A.	0113

PATENT INDEX

<u>PATENT</u>	<u>CITATION NO.</u>
<u>Britist Patent</u>	
1,543,555	80A-0148
<u>Canadian Patent</u>	
1,049,936	80A-0158
<u>Japanese Patent</u>	
79 45,689	80A-0170
79 47,887	80A-0146
<u>United States Patent</u>	
4,116,007	80A-0137
4,116,045	80A-0028
4,116,835	80A-0700
4,120,751	80A-0160
4,120,793	80A-0181
4,131,773	80A-0022
4,136,008	80A-0175
4,136,654	80A-0177
4,139,470	80A-0729
4,140,424	80A-0131
4,142,969	80A-0163
4,142,972	80A-0173
4,146,470	80A-0172
4,151,078	80A-0727
4,153,555	80A-0147

APPENDIX A
Periodicals Reviewed

Abstracts on Health Effects of Environmental Pollutants
Alternatives: Perspectives on Society and Environment
Ambio
American Fisheries Society Transactions
Analytical Chemistry
Applied Ecology Abstracts
Applied Energy
Applied Microbiology
Applied Science & Technology Index
Aquatic Sciences & Fisheries Abstracts
Audubon
Australian Science Index
Berichte der Deutschen Wissenschaftlichen Kommission fuer
 Meeresforschung
Bibliography and Index of Geology
Biological Abstracts
Bioresearch Index
Bioscience
British Birds
British Library. Lending Division. Index of Conference
 Proceedings Received
Bulletin of Environmental Contamination and Toxicology
Bulletin of Marine Science
Catalyst for Environmental Quality
Chemical Abstracts
Chemical and Engineering News
Chemical Engineering
Chemical Engineering Progress
Chemical Week
Chemistry in Canada
Chemosphere
Coastal Engineering
Coastal Zone Management Journal
Conservation News
Current Contents: Life Sciences
Current Contents: Physical and Chemical Sciences
Deep-Sea Research/Oceanographic Bibliography
Ecological Abstracts
Ecological Modelling
The Ecologist
Ecology Law Quarterly
Effluent & Water Treatment Journal
Energy Information Abstracts
Energy Review
The Engineering Index Monthly
Environment

Environment Abstracts
 Environment Reporter
 Environmental Action
 Environmental Conservation
 Environmental Geology
 Environmental Health and Pollution Control
 Environmental Management
 Environmental Periodicals Bibliography
 Environmental Pollution
 Environmental Research
 Environmental Science & Technology
 Environmental Technology and Economics
 EPA Environmental News
 EPA Reports Bibliography Quarterly
 ERDA Energy Research Abstracts
 Estuarine and Coastal Marine Science
 Fuel Abstracts and Current Titles
 Geochimica et Cosmochimica Acta
 Government Reports Announcements
 Groundwater
 Hydrocarbon Processing
 India Journal of Environmental Health
 Industrial Wastes Information Bulletin
 INTERDOK Directory of Published Proceedings
 International Aerospace Abstracts
 International Journal of Ecology and Environmental Science
 International Journal of Environmental Analytical Chemistry
 International Journal of Environmental Studies
 International Petroleum Abstracts
 Iranian Journal of Science and Technology
 The Journal of Applied Ecology
 Journal of Canadian Petroleum Technology
 Journal of Chromatography
 Journal of Environmental Science and Health, Part A
 Journal of Environmental Sciences
 Journal of the Institute of Water Pollution Control
 Journal of Petroleum Technology
 Journal of the Fisheries Research Board of Canada
 Journal of Toxicology and Environmental Health
 Limnology and Oceanography
 Marine Biological Association of the United Kingdom, Journal
 Marine Biology
 Marine Chemistry
 Marine Geology
 Marine Geotechnology
 Marine Policy
 Marine Pollution Bulletin
 Marine Pollution Research Titles
 Marine Science Contents Tables
 Marine Technology
 Marine Technology Society, Journal
 Maritime Research Information Service Abstracts
 Microbial Ecology
 National Fisherman
 National Research Council, News Report

National Wildlife
 Nature
 New Technical Books
 Nippon Susan Gakkai Shi. Bulletin of the Japanese Society of
 Scientific Fisheries
 Northwest and Alaska Fisheries Center Monthly Reports
 Ocean Engineering
 Ocean Industry
 Ocean Management
 Oceanic Abstracts
 Oceanographic Abstracts and Bibliography
 Oceanus
 Offshore
 Oil and Gas Journal
 Oil Spill Intelligence Report
 Outdoor California
 Pacific Oil World
 Petroleum Abstracts
 Petroleum Engineer International
 Petroleum Today
 Pollution Abstracts
 Pollution Engineering
 Proceedings in Print
 Progress in Water Technology
 Rapports et Proces Verbaux
 Resources
 Resource Recovery and Conservation
 Royal Society of London, Proceedings, Series B, Biological
 Sciences
 Science
 The Sciences
 Science News
 Science of the Total Environment
 Scientific and Technical Aerospace Reports
 Scientific Meetings
 Sea Frontiers
 Sea Secrets
 Sea Technology
 Selected Water Resources Abstracts
 Shore and Beach
 Spill Technology Newsletter
 Summaries of Foreign Government Environmental Reports
 Tanker Advisory Center Newsletter
 Technical Book Review Index
 Technology Review
 Toxicity Bibliography
 UDS Water Quality Control Digest
 Underwater Information Bulletin
 Underwater Naturalist
 Waste Materials Biodegradation Research Titles
 Water, Air and Soil Pollution
 Water & Pollution Control
 Water & Wastes Engineering
 Water Pollution Control Federation, Journal
 Water Research
 Western Fisheries

APPENDIX A
OIL POLLUTION ABSTRACTS--AVAILABILITY LISTING

OPA -current title: OIL POLLUTION ABSTRACTS
OPR -former title: OIL POLLUTION REPORTS
OSOPR-former title: OIL SPILL AND OIL POLLUTION REPORTS

TITLE	REPORT PERIOD	EPA ACCESSION NUMBER	NTIS ORDER NUMBER	PRICE	PAGES
OSOPR	Jul 74-Oct 74	EPA 670/2-75-003	PB 240-719	\$ 9.25	206
OSOPR	Nov 74-Feb 75	EPA 670/2-75-044	PB 242-542	10.75	261
OSOPR	Feb 75-Apr 75	EPA 670/2-75-059	PB 243-724	9.50	235
OSOPR	May 75-Jul 75	EPA 600/2-76-129	PB 258-852	12.00	315
OSOPR	Aug 75-Oct 75	EPA 600/2-76-113	PB 258-745	11.75	299
OSOPR	Nov 75-Jan 76	EPA 600/2-76-185	PB 257-886	12.50	353
OSOPR	Feb 76-Apr 76	EPA 600/2-76-215	PB 259-932	11.75	308
OSOPR	May 76-Jul 76	EPA 600/2-76-266	PB 264-870	12.50	345
OSOPR	Aug 76-Oct 76	EPA 600/2-77-037	PB 267-266	11.75	307
OSOPR	Nov 76-Jan 77	EPA 600/2-77-075	PB 268-248	11.75	294
OSOPR	Feb 77-Apr 77	EPA 600/2-77-111	PB 272-689	12.50	326
OSOPR	May 77-Jul 77	EPA 600/2-77-243	PB 276-691	13.00	375
OSOPR	Aug 77-Oct 77	EPA 600/2-78-005	PB 281-114	11.00	280
OSOPR	Vol. 5, No. 1 Nov. 77-Jan 78	EPA 600/2-78-071	PB 281-671	9.25	190
OPR	Vol. 5, No. 2 Feb 78-May 78	EPA 600/7-78-160	PB 287-071	10.75	242
OPR	Vol. 5, No. 3 Jun 78-Sep 78	EPA 600/7-78-218	PB 290-227	11.75	294
OPR	Vol. 5, No. 4 Oct 78-Dec 78	EPA 600/7-79-040	PB 293-315	9.25	189
OPA	Vol. 6, No. 1 Jan 79-Mar 79	EPA 600/7-79-160	PB 80-129-117	13.00	211
OPA	Vol. 6, No. 2 Apr 79-Jun 79	EPA 600/7-79-254	PB 80-141-583	16.00	281
OPA	Vol. 6, No. 3 Jul 79-Sep 79	EPA 600/7-80-007	PB _ _ _ _	_ . _	247
OPA	Vol. 6, No. 4 Oct 79-Dec 79	EPA 600/7-80-053	PB _ _ _ _	_ . _	200

These documents are available to the public through the National Technical Information Service (NTIS), U.S. Department of Commerce, Springfield, VA 22161, USA. Prices listed include postage and handling fees for North American users. Foreign users should contact NTIS for current price, postage, and handling information. NTIS requests prepayment for each order and will add a \$5.00 service fee for each order not accompanied by payment. Telephone orders are accepted at (703) 557-4650.